

Table of Contents

Preface

Chapter 1: Advances and Innovations in Metalworking

Study on the Current State of Research in the Field of Titanium Aluminides Milling Processes

P. Radu, C. Schnakovszky, E. Herghelegiu, E. García-Martínez and V. Miguel 3

Determination of Heat Transfer Coefficient in Casting: A Comparison of Analytical, Inverse and Trial-and-Error Methods

A. Vasileiou, G.C. Vosniakos and D. Pantelis 14

Preliminary Evaluation of a Multipass Strategy in Abrasive Waterjet Machining of an Alloy UNS A92024

F. Bañón-García, Á. Gómez-Parra, A. Sambruno and P.F. Mayuet 22

Influence of Power and Frequency in the Femtosecond Laser Texturing of Ti6Al4V

J. Salguero Gómez, M. Romero, I. Del Sol, M. Batista and J.M. Vazquez Martinez 32

Contributions Regarding the High-Speed Milling of Parts with Low Rigidity Made from Aluminum Alloys

P. Radu, C. Schnakovszky, C.N. Tampu, E. García-Martínez and V. Miguel 41

3D-Simulation of Heat Flow in Indexable Drilling

T. Andersson, D. Svensson and A.A. Lassila 51

Design and Evaluation of an Eco-Efficient RHVT-Cooled Ti6Al4V Drilling Process

L. Roldán-Jiménez, S.R. Fernández-Vidal, F.J. Puerta-Morales, A.P. Valerga-Puerta and F. Bañón-García 61

A Preliminary Geometrical Characterization of Surface Scratches on Aluminium Alloys Used in the Aerospace Industry

G. Domínguez-Domínguez, F. Mas and C. Vallellano 70

Influence of Grooves Angle of Textured Ceramic Tools on the Final Roughness and Cutting Forces of Cold Work Tool Steel

P. Fernández-Lucio, O. Pereira Neto, G. Urbikain, E. Ukar and L.N.L. de Lacalle 78

Feasibility Study of Handheld Laser Welding Technology for Small Thickness Aluminium Alloys

S.E. Berrizbeitia, I.C. Galnares, A.P. Egurtza, L.N.L. de Lacalle and O. Pereira Neto 86

Analytical and Numerical Models for the Analysis of the Multi-Stage Drawing Process of Zn Wires

O. Rodríguez-Alabanda, G. Guerrero-Vacas, F. Comino, E. Molero and J.C. del Rey 97

Formability Analysis of Stretch and Shrink Flanging by Single Point Incremental Forming Based on Stresses

J.A.L. Fernández, M. Borrego Puche, G. Centeno Báez and C. Vallellano 107

Evaluation of Geometric Defects Produced in Abrasive Water Jet Drilling of Steel S275JR

A. Sambruno, F.J. Puerta-Morales, J.A. Barba-Egea and F. Bañón-García 116

Manufacturing Bio-Inspired Material Surfaces for Enhancing Energy Efficiency and Applications

Ó. Jiménez-Salvador, R. Calvo and M.B. Rubio 124

Finite Element Analysis of DP600 Steel Strips in Deformation Tests

A. de la Calle Salas, S.S. Caballero, M.Á.P. Rasero, F.J.P. García and M.Á. Sellés Cantó 134

Chapter 2: Advances and Innovations in Composites and Polymers Treatment

Development of a CNC Grinding Process for the Manufacturing of Crystal Glass Products

H. Morais, A. Baraati, F. Carlos, E. Davim and R. Torcato 143

Influence of Cutting Parameters on Abrasive Machining of C/SiC Ceramic Matrix Composite

E. Irazu, B. Izquierdo, U. Alonso and F. Girot 152

Thermoplastic Starch (TPS) Obtained from Mango Kernel Flour by Means of Extrusion Process with Different Plasticizers	
J. Gomez-Caturla, J. Ivorra-Martinez, D. Garcia-Garcia, R. Balart, F. Dominici, D. Puglia and L. Torre	160
Manufacturing of Novel Cork-STF Composites Designed for Impact Energy Absorption	
G.J.A. Sousa, F.A.O. Fernandes, A.R.S. Rocha, G.F. Serra and R.J.A. de Sousa	167
Manufacture of Highly Environmentally Friendly Composites with Posidonia Oceanica and Poly Lactic Acid Compatibilized by Reactive Extrusion with Peroxide	
D. Lascano, L. Quiles-Carrillo, N. Montanes, O. Fenollar and T. Boronat	173
On the Assessment of the Failure Strains in Conventional and Incremental Forming of Polymer Sheets	
A. Rosa-Sainz, G. Centeno Báez, M.B. Silva and C. Valledellano	179
Influence of Impact Speed on the Quality of Riveted Lap Joints of Composite/Metal Stacks	
I. Ojeda, B. El Moussaoui, E. Iriondo and F.A. Girot Mata	189
On the Manufacturing of a Cranial PEEK Implant Using SPIF	
A. Rosa-Sainz, I. Ferrer, M.L. Garcia-Romeu, M.B. Silva and G. Centeno Báez	198
Analysis of the Feasibility of Producing Injection Moulded Components from Mechanically Recycled Fishing Nets	
M.V.A. Costa, J.P.G. Magrinho, J.F.M. Caseiro, A.L.L. Pires, N. Fidelis and M.B. Silva	208
Effect of Reactive Extrusion in Plasticized Polylactide Formulations with Biobased Dibutyl Itaconate	
J. Ivorra-Martinez, J. Gomez-Caturla, D. Garcia-Sanoguera, V. Moreno, F. Dominici, D. Puglia and L. Torre	217
CF Reinforced Thermoplastic Hybrid Process Proposal for the Optimization of Sandwich Panels Stiffness and Processability	
C. Rodríguez-Mondéjar, A. Rodríguez-Prieto and A.M. Camacho	223
Laser Marking of Engineering Thermoplastics: The Polyoxymethylene (POM) Case Study	
S.U. Ofoegbu, P.J.A. Rosa, F.A.O. Fernandes, A.B. Pereira and P. Fonseca	232
Delamination Factor Analysis in Cryogenically Drilled Holes in Fiberglass Reinforced Structures	
R. Domingo, M. Rodríguez-Martín, R. Calvo and M.M. Marín	241
Silk Fibroin Dip Coating as Drug Delivery Material for Medical Devices	
A. Bosch, E. Casanova-Batlle, J.M. Rodríguez-Rego, J. Ciurana and A.J. Guerra	247
Experimental Investigation on Surface Characteristics of Long Thickness Parts of CFRP during Abrasive Water Jet Machining Process	
F. Bañón-García, J. Salguero Gómez, R. Bienvenido and J.M. Vazquez Martinez	256

Chapter 3: Rapid Prototyping and Additive Manufacturing

Silk Fibroin/PLA 3D Printed Composite Stent Fabricated through Direct Ink Write Technology	
E. Casanova-Batlle, A. Bosch, A.J. Guerra and J. Ciurana	267
Determination of Suitable Geometrical Ranges for the Manufacture of Microfluidic Channels by Low-Cost Additive Manufacturing Techniques	
A. Garcia-Dominguez, J. Ayllón, A. Rodríguez-Prieto, J. Claver, O. Monago-Maraña, A.G. Crevillén and A.M. Camacho	276
Microstructure and Properties of AISI 316L Steel Processed by Selective Laser Melting Technology (SLM) and Hot Isostatic Pressing Technology (HIP)	
D. Bricín and J. Mocek	285
Soluble vs Non-Soluble Support Materials for Bone 3D Printed Anatomical Models: A Comparison on Production Time, Cost and Finish Quality	
M. Engli Rueda, N.A. Gomez, G.M. Navarro, J.M. del Cerro and A. Valls Esteve	294
Development and Optimization of Processing Parameters of 316L Stainless Steel and Inconel 718 by Wire Feed Direct Energy Deposition/Laser Beam (W-DED/LB)	
J. Santaolaya, J. Sogorb, I. González-Barba, A. Periñán and F. Lasagni	302
A Methodology to Characterize Structurally the Bonding between Two Parts Made of FDM-3D Printed Dissimilar Materials	
D. Rodríguez Engasa, P. Rodríguez de Francisco and J.L. Casado Corpas	311

Influence of PMMA 3D Printing Geometries on the Mechanical Response	321
C. Rufo-Martín, J. Díaz-Álvarez and D. Infante-García	
Parametric Study of Functional Components Obtained by Additive Manufacturing Fused Filament Fabrication	330
D. Jesus, C. Relvas and A.M. Ramos	
Quality Comparison of Three Metal Additive Manufacturing Technologies on an Automotive Sealant Nozzle	338
J. Ortiz-Cañavate, S. Ferrández, C. Cambralla and J. Igual	
Desiccant Dehumidification System Developed Using Additive Manufacturing and Biodegradable Materials	348
F. Comino, P.E. Romero, E. Molero and M. Ruiz de Adana	
High Compactness Heat Exchanger Manufactured Using Stereolithography Technology and Photosensitive Resin	355
P.E. Romero, F. Comino, E. Molero and M. Ruiz de Adana	
Digital Testing of Hybrid Components Manufactured by L-DED and Forging	362
O. Murua De la Mata, J.I. Arrizubieta Arrate, G.G. Escudero, A.L. Mentxaka and E. Ukar	
Effect of Printing Orientation on Product Quality and Overall Process Efficiency: an Experimental Investigation	372
A. Greco, P. Manco, M. Fera, P. Maresca and S. Gerbino	
Porosity Reduction in 15CDV6 Steel Manufactured by L-DED	382
A. Urresti Ubillos, J.I. Arrizubieta Arrate, O. Murua De la Mata, M. Aristizabal and E. Ukar	
Design of Supports to Avoid Deformations in the Process of Alumina Printing by Stereolithography	391
S. Martínez-Pellitero, A.M. Souto, S. Peláez Peláez, J. Barreiro García and M.Á. Castro Sastre	
Methodology for the Acoustic Analysis of Acoustic Guitar Top Plates Designs by Additive Manufacturing	400
Á. Burgos Pintos, P.F. Mayuet, M. Alonso Gracia and L. Rodríguez-Parada	
Evaluation of Metallic Parts Defects to Determine Repair Process Strategies through Laser Metal Deposition	409
M.O. da Cruz, D.G. Afonso and M.A.R. de Oliveira	
Study of Improvement of the Build Rate of Ti-6Al-4V Alloy by Laser Beam Powder Bed Fusion Technology	420
L. Portolés Griñán, J.R. Blasco Puchades, J. Zambrano Carrullo, O.J. Ferrando and J.A. García-Manrique	
Material Extrusion of 3D Printed Ceramics Parts: Parameters, Structures and Challenges	429
I. Buj-Corral, A. Tejo-Otero, F. Fenollosa-Artés, R. Uceda-Molera, J. Elmesbahi and A. Elmesbahi	
Fatigue Behavior Analysis in Reinforced PLA Parts Manufactured by FDM	437
C. Bermudo Gamboa, S. Martín-Béjar, F.J. Trujillo Vilches, M. Herrera Fernández and L. Sevilla Hurtado	
Optimization of Sandblasting to Improve the Surface Finish of 17-4PH Parts Manufactured by SLM Using Different Laser Scanning Strategies	445
S. Giganto, S. Martínez-Pellitero, P. Rodríguez-Mateos, N. Soni and J. Barreiro García	
The Tolerancing Obtained with Binder Jetting Additive Manufacturing Process in 17-4PH Steel - Case Study	452
E. Lima, C. Relvas and A.M. Ramos	
Recipe to Strengthen Continuous Fiber Reinforced 3D Printed Parts	460
A.J. García Collado, G. Medina Sánchez, M.F. Guerrero-Villar and R.D. Vicente	
Experimental Study on the Infill Density Effect on Reduced Compressive Mechanical Properties of Additively Manufactured ASA	466
E.L. Papazoglou, N.E. Karkalos, P. Karmiris-Obrotanski and A.P. Markopoulos	
Weighting of Criteria for the Application of the Analytical Hierarchy Process (AHP) in the Selection of FDM Equipment through the Design of an Artefact	475
D.S. Pérez, A. Garcia-Dominguez and J. Claver	
Bringing Medical Model Scans into Reality through 3D Printing: Materials and Manufacturing Parameters	483
B. Adrover-Monserrat, J. Lluma, B. Luis-Torres, R. Jerez-Mesa and J.A. Travieso-Rodriguez	
The Use of Cork and Silicone Rubber with Embedded Sensors in Sports' Smart Protections: Studies on the Impact Absorption Performance	493
A. Pereira, D.G. Afonso, L. Pires and V. Clemente	

Machinability of Selective Laser Melted 17-4 PH Stainless Steel in Turning Process A.I. Fernández Abia, P. Rodríguez González, M.Á. Castro Sastre and S. Giganto	504
The Effect of Design and Fabrication Parameters on the Mechanical Properties of 3D Re-Entrant Honeycomb Auxetic Structures A. García-Dominguez, A. Rodríguez-Prieto, J. Ayllón, J. Claver, J. Rodríguez-Hernández and A.M. Camacho	511
Influence of Design Parameters and Materials on the Performance of Closed-Wall Lattice Structures S. De la Rosa, P.F. Mayuet, C. Silva, Á.M. Sampaio and L. Rodríguez-Parada	519
Generation and Characterization Metrology of Textures for Design of Urban Furniture with Recycled Material - A Case of Study for Additive Manufacturing L. Rodríguez-Parada, S. De la Rosa, M.Á. Pardo-Vicente, J.R. Méndez-Salguero and P.F. Mayuet	527
Influence of Process Parameters in LMD for Geometrical Accuracy and Thin Geometry with AISI316L C. de Lemos, D.G. Afonso, R. Torcato, M. Oliveira and C. Santos	536
Laser Powder Bed Fusion (L-PBF) for Cellular Structures Formed by a Heterogeneous Skeleton H.G. Barrio, A.C. Ochoa, G.G. Escudero, S. Mishra, M.M. de Aguirre, A.L. Mentxaka and L.N.L. de Lacalle	546
Design and Fabrication of a New Filament, PLA with PTFE as Fillers, for Water Repellent Surfaces E. Molero, B. Torres, O. Rodríguez-Alabanda and G. Guerrero-Vacas	554
Design of Pastes for Direct Ink Writing of Zirconia Parts with Medical Applications I. Buj-Corral, J.A. Padilla, J. Minguela-Canela, L. Rodero, L. Marco and E. Xuriguera	562
Machinability Characterization of 3D Printed PEEK D. Gómez-García, A. Díaz-Álvarez, M.H. Miguélez and J. Díaz-Álvarez	569
On the Processability of Aluminium Alloys by PBF-L/M Additive Manufacturing Technology I. González-Barba, A. Periñán, J. Santaolaya, Á. Nieto, C. Galleguillos, D. Hervás and F. Lasagni	579
Improvement of the Thermal Performance of a Drilling Tool Case by Using Metal Additive Manufacturing C. Galleguillos, D. Hervás, A. Periñán and F. Lasagni	588
Tensile Behaviour of PLA Parts Manufactured by FFF with Defects in the Interlayer Filament Bonding and its Application in Product Design M.Á. Pardo-Vicente, D.M. Nieto, D. Moreno-Sánchez, P. Pavón-Domínguez and M. Herrera-Collado	595

Chapter 4: Tools and Equipment

Time Domain Simulation of Surface Topography in Broaching Considering Tools with General Cutting Edge Geometries and Three DoF Parametric Dynamics Z. Iklodi, Z. Gabos, A. Bártfai and Z. Dombovari	607
Study of 3D Metal Printed and Metal Filled Epoxy Materials for Rapid Tooling in Injection Molding J.V. Abellán-Nebot, J. Serrano, K. Habib and J. Gual	617
Development of Flexible Tooling for Deformation Sensing Applied to Composite Materials Fabrication Process A.F. Zelaya Matamoros, D. Maldonado-Hurtado, J.A. García-Manrique, P. Causse and S. Sales	627
Tribological Analysis and Operation Issues of SiO₂ Nanolubricants for MQL Machining Operations R. Mondragón, J.V. Abellán-Nebot, K. Habib and J. Serrano	635
Mathematical Optimization of Cold Wire Drawing Operations F.J. Doblas-Charneco, D. Morales-Palma, A. Estevez and C. Vallellano	645
Dimensional Analysis of the Wear of 3D Printed Dies Used to Form PC and PVC Sheets by Thermoforming M.L. Garcia-Romeu, I. Ferrer, A. Brisa and F.J. Espinach	654

Data Analytics Applied to Tool Condition Monitoring during Drilling of Hybrid Stacks in Industrial Aircraft Production Systems	
A. Hernández-Valle, C. Domínguez-Monferrer, A. Guerra-Sancho, M.H. Miguélez and J.L. Cantero	662
Analysis of Printing Parameters for Sheet Metal Bending with FDM Printed Tools	
P. Rodríguez González, P. Zapico García, L.L. Fernández, S. Peláez Peláez and A.I. Fernández Abia	671
Catastrophic Tool Failure Detection in Aeronautical Industrial Drilling Systems Based on Spindle Power Consumption Analysis	
A. Guerra-Sancho, C. Domínguez-Monferrer, M.H. Miguélez and J.L. Cantero	679
Development of a Low Cost Extrusion Based 3D Printer for High Performance Engineering Polymers	
A. Ioannidis, M. Boufali, G.C. Vosniakos and T. Anagnostakis	689
Metrological Assessment of Microtextured EDM Electrodes Generated by Additive Manufacturing and Electroforming	
M. Hernández-Pérez, P.M. Hernández-Castellano, C.J. Sánchez-Morales, M.D. Marrero-Alemán and J.M. Vazquez Martinez	698

Chapter 5: Robotics, Mechatronics and Automation

Design and Validation of Gripper Solution Using Soft Robotics Principles	
P.J.P.D. Pereira, R.D.S.G. Campilho, J.P.G.T. Pereira, L.C.F. Moreira and C. Prakash	711
Weld Joint Reconstruction and Classification Algorithm for Trajectory Generation in Robotic Welding	
D. Curiel, F. Veiga, A. Suárez, P. Villanueva and E. Aldalur	722
SIMO: An Automatic Speech Recognition System for Paperless Manufacture	
R. Luque, A.R. Galisteo, P. Vega and E. Ferrera	731
Full Automation of a Manual Inspection Unit for Industrial Borescopy	
A. Gil-Cuadrado, A. Martínez-Gutiérrez, J. Díez-González, P. Verde, R. Ferrero-Guillén and H. Perez	742
On-Machine CIS SoC-Based Layerwise Inspection System for MEX Additive Manufacturing	
A. Fernández, P. Fernández, F. Peña and D. Blanco	749
Using PETG/rPET Blends in Fused Particle Fabrication: Analysis of Feasibility and Mechanical Behaviour	
P. Fernández, R. Marqués, N. Beltrán, B. Puerto and D. Blanco	757
Characterisation of the Performance of a Structured Light Digitising Sensor by Using Different Materials and Surface Finishes	
P. Zapico García, E. Cuesta, V. Meana, G. Suárez, S. Mateos and P. Rodríguez González	765
Design of a Test Bench to Measure In-Plane Friction Forces Produced by a New Under-Actuated Modular Device	
E. Bianchi, O.J. Jorg, G. Fantoni, F.J. Brosed Dueso and J.A. Yagüe-Fabra	774
Parametric Design of a Structural Plate for a Microsatellite	
A.M. Amores, E.M. Andrés-Lopez and A. Sanz-Lobera	784

Chapter 6: Industrial Measurements, Metrology and Product Quality Control

Development of a Test Bench for the Experimentation of the Electrical Performance of 3D Printed Multi-Material Parts	
J. Minguella-Canelas, J. Rabassa Manzano and I. Buj-Corral	795
CT-Based Dimensional Metrology for Quality Assessment of the Internal Structure of Additive Manufactured Aluminum Parts	
I. Holgado, N. Ortega, J.A. Yagüe-Fabra, H. Villarraga-Gomez and S. Plaza	806
Surface Characterisation and Comparison of Polymeric Additive Manufacturing Features for an XCT Test Object	
D. Gallardo, M. Concha, L. Díaz, R. Jiménez, M. Torralba, J.A. Albajez and J.A. Yagüe-Fabra	816

Development of Quality Assurance System in the Automotive Industry L.S. Gonçalves, R.D.S.G. Campilho and C. Prakash	826
Surface Quality Optical Measurement of Part Inclined Planes Manufactured by FDM Technology G. Medina Sánchez, J.A. Ordóñez Partal, R. Dorado Vicente and M.F. Guerrero-Villar	836
Automatic Wear Detection on Normalized Gears Made by Additive Manufacturing from Dense 3D Point Clouds M. Rodríguez-Martín, P. Rodríguez-González, L. Aguado and S. Martínez-Pellitero	847
Thermal Error Compensation Strategy in Simultaneous Laser Multilateration for Volumetric Verification F.J. Brosed Dueso, J.J. Aguilar Martín, R. Acero Cacho, J.S. Mazo, S.A. Jiménez and M.P. Arteta	855
Influence of Slicing Strategy on FFF Parts Dimensional Deviations L. Robles-Lorite, R. Dorado Vicente, E. Torres-Jiménez and A.J. García Collado	863
Analyzing the Influence of Dressing Parameters on the Real Depth of Cut during Rotary Dressing of Vitrified Bonded CBN Grinding Wheels E. Martín, L. Godino, J. Álvarez and J.A. Sánchez	870
Laser Profilometry Application in Welding Geometrical Characterization S. Martín-Béjar, J.M. Cañero-Nieto, J.F. Solano Martos and L. Sevilla Hurtado	879
A Modelica Library to Simulate Geometrical and Dimensional Deviations in Process Assemblies D.A. Antolí, P. Rosado-Castellano and S.B. Nácher	887
An Analysis of the Circularity of the Holes in the Drilling of Basalt Fiber Reinforced Laminates J. Ayllón, J. Claver, B. de Agustina and R. Domingo	896
Design of a Test Part for Verification and Validation of a Three Linear Axes Machine Tool S.A. Jiménez, L. Lorente, J.A. Albajez, J. Velázquez and J.S. Mazo	904
Thermal Measurements Based on Image Processing for <i>In Situ</i> Monitoring of 3D Fused Filament Fabrication (FFF) J.M. Cañero-Nieto, C.E. Deluque Toro, J.F. Solano Martos, I.B. Díaz Bolaño and R.J. Campo Campo	914
Influence of a Single Machine-Tool Vibration on the Workpiece Waviness Profile in Turning M. Gil-Inchaurreta, X. Beudaert, J. Munoa, D. Barrenetxea and J.A. Sánchez	924
Ductile Fracture Analysis in Nakazima vs. SPIF Tests M. Borrego Puche, D. Palomo, A.J. Martínez-Donaire, D. Morales-Palma and C. Vallellano	934
Analysis of the Temperature Evolution at Necking during Tensile Deformation of H240LA Steel Sheets D. Palomo, A.J. Martínez-Donaire, M. Borrego Puche and C. Vallellano	941
Machine Learning Approaches for Classification of Ultra High Carbon Steel Micrographs J. Muñoz-Ródenas, V. Miguel, F. García-Sevilla, J. Coello and A. Martínez-Martínez	951
Quality Evaluation and Analysis of Force Signals in CFRP Helical Milling F.J. Puerta-Morales, A. Sambruno, L. Roldán-Jiménez, J. Salguero Gómez and S.R. Fernández-Vidal	960
Surface Quality Control by X-Ray Fluorescence C. Moreno-Díaz, P. Maresca, J. Caja García and A. Andrés Dámaso	970
Evaluation of Machining-Induced Chatter and Part Quality in TiAl Alloys Turning Processes by Means of Harmonics Analysis E. García-Martínez, V. Miguel, M.C. Manjabacas, J. Coello and M.C. Radu	980
Materials for Hydrogen Storage and Transport: Implications for Risk-Based Inspection L. Giannini, A. Alvaro, A. Campari and N. Paltrinieri	990

Chapter 7: Product Design

Design for the Manufacture of a Video Game Controller Applying Emotional Design Ó. López Pérez, A. González González, F.J. Álvarez García, D. Rodríguez Salgado and J.F. Vázquez Pons	1003
End-to-End Bioinspired Lightweight Structure Manufacturing-Oriented Design, Validation, and Manufacturing with Advanced Methods I.L. Blanc, M.G. de Cortazar and F.A. Girot Mata	1014

Data Preparing for Reverse Engineering D. Kubátová, L. Čížek and V. Netrval	1024
Tailoring HALT/HASS Tests towards Product Reliability Growth and Cost Saving F. Mancusi, V. Romaniello, F. Fruggiero, S. Martino, A. Drago and A. Lambiase	1034
Analysis of the Applicable Regulations and Definition of the Procedure for the Commissioning of Enclosures for High-Precision Electronic A. Sanchidrián, A. Brunete, F. Gómez, M. Hueso, A. Ochoa, F. Santos and C. Tank	1045

Chapter 8: Engineering Management

Theoretical Model for Carbon Footprint Calculus Based on Energy Consumption for Polymer Additively Manufactured Parts M.E. Hernandez Korner, M.P. Lambán, J.A. Albajez, J.S. Mazo, L.d.C.N. Corrales and J. Royo	1057
Implementation of Bacterial Cellulose in Production Plants for Waste Disposal C. Moreno-Díaz, P. Maresca, C. Barajas and P. Menéndez	1066
Last Trends in the Application of the Hybrid Additive and Subtractive Manufacturing in the Aeronautic Industry M.A. Rabalo, A. Garcia-Dominguez, E.M. Rubio, M.M. Marín and B. de Agustina	1076
Prospective in Additive Manufacturing Based on R-Meta-Analysis and Bibliometric Study M. Rodríguez-Martín, R. Domingo and J. Ribeiro	1086
Application of the Human-Oriented Planning Model in the Supply Chain: From the Global System to Specific Cases D. Gallego-García, S. Gallego-García and M. García-García	1096
A Maintenance-Based Project Management Approach towards Organizational Sustainability Goals E. García-García, S. Gallego-García, D. Ren and M. García-García	1107
Optimizing the Supply Chain of Intensive Care Unit Blood Culture Samples to Clinical Microbiology Laboratory Using Lean Six Sigma D. Sancho, R. Acero Cacho, M.J. Lavilla, M. Corral, A. Carrillo-López and A. Rezusta	1117
The Use of Simulation and Artificial Intelligence as a Decision Support Tool for Sustainable Production Lines M.G. Cardoso, E. Ares, L.P. Ferreira and G. Peláez	1128
Impact of Key Enabling Technologies on Safety Risks in Shipbuilding. Application to Painting Activities on Large Vessels M. Ramirez-Peña, M. Otero-Mateo, A. Pastor-Fernandez, M. Batista and A. Cerezo-Narvaez	1136
Guide for the Implementation of Operational Control Procedures in Underwater Cutting and Welding Activities J.F. Solano, S. Martín-Béjar, J.M. Cañero-Nieto and L. Sevilla Hurtado	1146
Performance Improvement in Service Manufacturing Lines Supported by Information Sharing and Task Assignment Flexibility A.G. Arteaga and R. Calvo	1155
Development of Real-Time Indicators to Assess and Improve the Energy Efficiency of Machine Tools M.P. Lambán, P. Morella, J.C. Sanchez, A. Les, J. Royo and F. Quero	1166

Chapter 9: Industry X.0, Digital Manufacturing, and CAx-PLM Technologies

Implementation of a Test Plan Ontology for Incremental Sheet Metal Forming Made with Models for Manufacturing (MfM) Methodology D. Morales-Palma, F. Mas, R. Arista, M. Oliva and C. Valellano	1175
Determination of Cost-Effective Machining Strategies for Rough Pocket Milling of Aluminum by Computer-Aided Manufacturing E. García-Martínez, V. Miguel, Á. Mancebo and A. Martínez-Martínez	1184
Digital Twin Development and Validation for a Tapered Roller Bearing Multi-Stage Production Line J. Domínguez, A. Esteban, J.A. Romeo, F. Cebrián, S. Santo Domingo and J.J. Aguilar Martín	1192

A Prototype of the Digital Twin of an Aerospace Industrial Production Line G. Domínguez-Domínguez, M. Romero, D. Morales-Palma, M. Oliva and F. Mas	1202
NC Toolpath Generation and Optimization from 3D Point Cloud in Reverse Engineering A. García-Domínguez, J. Claver, J. Ayllón, M.M. Marín and E.M. Rubio	1212
Technological Migration from I3.0 to I4.0 Applying Concurrent Engineering and Adapted Agile Management Methodologies I. Iglesias, M. Araujo, E. Ares and G. Peláez	1221
Comparison of Augmented Reality Technologies Applied to Assembly Processes in Aerospace Industry F.J. Servan and M. Oliva	1231
Augmented Reality in Industrial Manufacturing - Identification of Application Areas for AR-Based Quality Control/Assembly Based on Technology Suitability P.T. Ho, J.A. Albajez, J.S. Mazo and J.A. Yagüe-Fabra	1241
A Proposal for Using Models for Manufacturing (MfM) Methodology to Reconfigure Aerospace Manufacturing Systems R. Arista, F. Mas, D. Morales-Palma and C. Vallellano	1249
Redesign of Manufacturing Workstation with Value Sensitive Design and Axiomatic Design to Incorporate Values of Industry 5.0 A. Agote-Garrido, A.M. Martín-Gómez and J.R. Lama-Ruiz	1258
Extended Reality in End of Arm Tooling Development and Assembly P. Pesca and D.G. Afonso	1268
Application of Models for Manufacturing (MfM) Methodology to Aerospace Sheet Metal Parts Manufacturing M.H.B. Andrade, A.L. Szejka and F. Mas	1278
An Approach to Zero-Failures Maintenance Using Industry 4.0 in Network Connected Multistage Industrial Machines F.J. Álvarez García, Ó. López Pérez, A. González González and D. Rodríguez Salgado	1287
Maintenance Data Management: The Potential Effect of Blockchain Technology M.A. Turino, P. Manco, P. Maresca and R. Macchiaroli	1297

Chapter 10: Some Social Aspects of Industrial Development

Human Needs Evolution and Organizational Development: A Case Study Analysis towards the Fifth Industrial Revolution S. Gallego-García and M. García-García	1307
Deontology in Industrial Engineering: A Comparison between some Spanish Autonomous Communities A.C. Larrañaga Pastor, C. González Gaya and C. de Lama Burgos	1318

Chapter 11: History of Technology and Machines, Industrial Heritage

Virtual Modeling of the Brown and Sharpe's Universal Grinding Machine from 1877 F.J. Trujillo Vilches, M. Herrera Fernández, C. Bermudo Gamboa and L. Sevilla Hurtado	1329
Historical and Technological Study and Scale Reconstruction of Trebuchet J.L. Ródenas-Vigil, R. López-García, G. Medina Sánchez and M.F. Guerrero-Villar	1339
Multicriteria Decision Methodology Applied to the Textile Factory "La Juanona" in Antequera C. Bermudo Gamboa, S. Martín-Béjar, J. Claver and L. Sevilla Hurtado	1348
Technological and Heritage Analysis of a Singular Screw Press from the early 19th Century of the Museum of the Royal Factories of Riopar (Spain) M.Á. Sebastián, J. Claver, L. Sevilla Hurtado, F.J. Trujillo Vilches, M. Vera and A. Galán	1356
Identification of Criteria for the Protection and Enhancement of Railway Industrial Heritage Assets through the Analysis of Two Examples on the Border between Spain and Portugal J.I. de Grado, J. Claver and M.Á. Sebastián	1365

Chapter 12: Supporting the Teaching and Learning Process in Engineering Education

Creation of a Model of a Cutting Tool Using Additive Manufacturing for Visualization of Machining Angles

F.d.S. Martín Fernández, M.J. Martín Sánchez, M.J. Cano Iglesias and F. Carrión Rodríguez

1377

Simulation-Assisted Analysis of Sand Casting Distribution Systems for Teaching Purposes

A. Sambruno, P. Márquez, F. Bañón-García, F.J. Puerta-Morales and Á. Gómez-Parra

1385

Other Dimensions of Additive Manufacturing: Learning and Development of Technical Skills in Bachelor Subjects

A.M. Camacho, A. Rodríguez-Prieto, J. Claver, J. Ayllón, A. García-Dominguez, B. de Agustina, E.M. Rubio, A. Holl and I. García

1394

Diagnosis of Students' Mathematical Background to Address Manufacturing Courses

J. Serrano, G.M. Bruscas-Bellido, S. Benavent-Nácher, P. Rosado-Castellano and J.V. Abellán-Nebot

1403