## Contents

### Part I  Section One: Product, Process and Factory Integrated Design

<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impacts of Product Lifecycle and Production System Design on Competitive and Sustainable Production</td>
<td>3</td>
</tr>
<tr>
<td>Hasse Nylund, Mikko Tapaninaho, Seppo Torvinen and Paul H. Andersson</td>
<td></td>
</tr>
<tr>
<td>A Framework for Optimizing Product Performance Through Using Field Experience of In-Service Products to Improve the Design and Manufacture Stages of the Product Lifecycle</td>
<td>15</td>
</tr>
<tr>
<td>Joel E. Igba, Kazem Alemzadeh, Paul M. Gibbons and John Friis</td>
<td></td>
</tr>
<tr>
<td>Advanced Product and Process Design Through Methodological Analysis and Forecasting of Energy Consumption in Manufacturing</td>
<td>29</td>
</tr>
<tr>
<td>Tim Spiering, Stephan Kohlitz and Harald Sundmaeker</td>
<td></td>
</tr>
<tr>
<td>Cost-Based Evaluation for Product Selective Disassemblability</td>
<td>45</td>
</tr>
<tr>
<td>Qingjin Peng, Yongtao Luo and Peihua Gu</td>
<td></td>
</tr>
<tr>
<td>Risk Management Methodology Covering the Entire Product Lifecycle</td>
<td>59</td>
</tr>
<tr>
<td>Jan Machac and Frantisek Steiner</td>
<td></td>
</tr>
<tr>
<td>An Approach for the Selection of Process Plans Based on Part Family Changes</td>
<td>65</td>
</tr>
<tr>
<td>S. M. Hasan and A. Baqai</td>
<td></td>
</tr>
<tr>
<td>Development of an Open-Architecture Electric Vehicle Using Adaptable Design</td>
<td>79</td>
</tr>
<tr>
<td>Qingjin Peng, Yunhui Liu, Peihua Gu and Zhun Fan</td>
<td></td>
</tr>
</tbody>
</table>
Ergonomics Issues in Furniture Design: A Case of a Tabloid Chair Design
R. M. Shah, M. A. U. Bhuiyan, R. Debnath, M. Iqbal and A. Shamsuzzoha

Solid Wood Panel Manufacturing Using Low Quality Materials
Omar Espinoza, Urs Buehlmann and Maurice Deaver

Performance-Oriented Manufacturability Analysis of a 5 GHz Satellite Oscillator
Harri Eskelinen, Pekka Eskelinen and Juhana Ylinen

Concept of the System for Optimization of Manufacturing Processes
Silvia Palajová and Milan Gregor

Structured Analysis of Reconfigurable Manufacturing Systems
Erik Puik, Daniel Telgen, Leo van Moergestel and Darek Ceglarek

A Methodology for the Estimation of Build Time for Operation Sequencing in Process Planning for a Hybrid Process
Zicheng Zhu, Vimal G. Dhokia, Aydin Nassehi and Stephen T. Newman

Capability-Based Approach for Evaluating the Impact of Product Requirement Changes on the Production System
Eeva Järvenpää and Seppo Torvinen

Manufacturing Processes Design with UML and ERP Standard: A Case Study
Agnieszka Stachowiak, Izabela Kudelska and Adam Radecki

FMEA as Applied to Electronic Manufacturing: A Revised Approach to Develop a More Robust and Optimized Solution
J. Enright, H. Lewis and A. Ryan

Simulation of the Pneumatic Behavior in the Virtual Commissioning of Automated Assembly Systems
Anton Strahilov, Dennis Effmert and A. N. Other
Alexandra F. Marques, Miguel Mujica, Jorge Pinho de Sousa, Paulo Sá Marques, Rui Rebelo and António C. Alves

Multi-Agent Simulation for Concept of Cellular Transport System in Intralogistics .................................................. 233
Mustafa Güller, Yılmaz Uygun and E. Karakaya

Modeling and Simulation of a Laser Scanner Sensor: An Industrial Application Case Study ...................... 245
Jose Lima, José Gonçalves, Paulo J. Costa and A. Paulo Moreira

On the Application of Discrete-Event Simulation in Production ............................................................... 259
Farhad Norouzilame and Mats Jackson

A Simulation Study on Assemble-to-Order Production for a Taiwan Machine Tools Manufacturer ....................... 273
Yi-Chi Wang, Toly Chen and Fu-Chun Chuang

The Use of Computer Simulation in Warehouse Automation ............... 285
Joanna Oleśkow-Szlapka and Agnieszka Stachowiak

Optimal Safety Stock Policy for a Hybrid Manufacturing System: A Simulation Study .......................... 295
Horng-Chyi Horng

Modeling and Simulation of the EMG30 Geared Motor with Encoder Resorting to SimTwo: The Official Robot@Factory Simulator ................................................. 307
José Gonçalves, José Lima, Paulo J. Costa and A. Paulo Moreira

New Concepts for a Flexible and Industrialized Production Process for FRP-Based Transport Infrastructure Components .................................................. 315
Andreas Kluth and Jens Michael Jäger

Increasing Flexibility and Productivity in Small Assembly Operations: A Case Study .................................................. 329
P. M. S. Nunes and F. J. G. Silva
P-SOP Agent Generator for Flexible Manufacturing .............. 341
Bo Svensson, Anders Nilsson and Fredrik Danielsson

Flexible Work Organization and Working Time Flexibility as Flexibility Strategies for Small and Medium-Sized Enterprises ................................................................. 355
Ralica Ivanova, Heiko Baum, Jens Schütze and Martina Ganß

Agent-Based Service-Oriented Architecture for Heterogeneous Data Sources Management in Ubiquitous Enterprise ............. 367
L. Y. Pang, Ray Y. Zhong and George Q. Huang

Implications of Interoperability for Factory Planning ............. 379
Sebastian Horbach

Computer Aided Process Planning:
A Comprehensive Survey ................................................. 389
Yusri Yusof and Kamran Latif

Interoperable Data Provisioning and Discovery for Virtual Factories .......................................................... 401
Atanas Manafov, Georgi Pavlov, Velimir Manafov and Irena Pavlova

Designing of Cloud-Based Virtual Factory Information System ................................................................. 415
Yuqiuge Hao, Rafael Karbowski, Ahm Shamsuzzoha and Petri Helo

Enabling Virtual Manufacturing Enterprises with Cloud Computing: An Analysis of Criteria for the Selection of Database as a Service Offers .................................................. 427
Ronny Hans, David Dahlen, Sebastian Zöller, Dieter Schuller and Ulrich Lampe

An Infrastructure to Construct an Individualized Manufacturing Information System for Small and Medium Manufacturing Enterprises .................. 439
Joseph Oh, Bo-Hyun Kim and Jae-Yong Baek

Business Process Monitoring and Management in Virtual Enterprise Through Interactive User Interface Layer ............. 451
Ahm Shamsuzzoha, Filipe Ferreira, Américo Azevedo, José Faria and Petri Helo
Part II  Manufacturing Technologies and Intelligent Systems

Nokucinga Majija, Khumbulani Mpofu and D. Modungwa

Global Green Production by Integration of Automated Decision Layers .......................................................... 479
Reza Hosseini and Petri Helo

Flexible SOA Based Platform for Research on Start-Up Procedures for Reconfigurable Production Machines ........ 489
M. Abel and P. Klemm

Application of Modularity Principles in the Press Tool Enterprise: Reconfigurability ........................................ 503
Simon Phuluwa, Khumbulani Mpofu and S. P. Ayodeji

Design of a Multifunctional Cell for Aerospace CFRP Production ................................................................. 515
F. Krebs, L. Larsen, G. Braun and W. Dudenhauen

Electrode Wear Estimation and Compensation for EDM Drilling ................................................................. 525
Cheol-Soo Lee, Eun-Young Heo, Jong-Min Kim, In-Hugh Choi and Dong-Won Kim

Topography-Selective Removal of Atmospheric Pressure Plasma Polishing ..................................................... 537
Jufan Zhang, Bing Li, Wei Dang and Ying Wang

A PLCopen-Based Approach for Utilizing Powerful Industrial Robot Functions in PLC-Controlled Applications .......... 547
Fan Dai and Oliver Becker

On Analyzing the Semantics of IEC61131 -3 ST and IL Applications ............................................................ 559
Mario de Sousa

Standard Function Blocks for Product Oriented Programmed Process Data Access .............................................. 573
Julio Garrido Campos
CN2-SD for Subgroup Discovery in a Highly Customized Textile Industry: A Case Study ........................................ 585
S. Almeida and C. Soares

Statistical Process Control Methods as an Essential Tool for Modeling and Improvement of Diagnostic Processes .......... 597
Martina Winkelhoferova, Veronika Marikova and Jiri Tupa

Rough Cut Machining for Impellers with 3-Axis and 5-Axis NC Machines ........................................ 609
Dong-Won Kim, M. A. Suhaimi, Byung-Mun Kim, Min-Ho Cho and F. Frank Chen

Discharge Parameters for Pass-Through Holes in EDM-Drilling ........................................ 617
Cheol-Soo Lee, Jong-Min Kim, Yong-Chan Choi, Eun-Young Heo and Dong-Won Kim

Graph-Based Analysis of Metal Cutting Parameters .......... 627
Samps Laakso, Jaakko Peltokorpi, Juho Ratava, Mika Lohtander and Juha Varis

A Surface Roughness and Power Consumption Analysis When Slot Milling Austenitic Stainless Steel in a Dry Cutting Environment ........................................ 637
Patricia Muñoz-Escalona, Alborz Shokrani, Vimal Dhokia, Reza Imani-Asraei and Stephen T. Newman

Development of an Intelligent Bolt Tensioning System and Adaptive Process for the Automated Pitch Bearing Assembly of Wind Turbines ........................................ 651
Leenhard Hörauf, Rainer Müller, Jochen Bauer, Holger Neumann and Matthias Vette

Knowledge-Based Operation Planning and Machine Control by Function Blocks in Web-DPP ........................................ 665
Mohammad Givehchi, Bernard Schmidht and Lihui Wang

Self-Learning Production Systems: Adapter Reference Architecture ........................................ 681
Gonçalo Cândido, Giovanni Di Orio and José Barata
Forecasting Order Quantity for Treadmill Part by Comparison of Time Series Forecast Technologies and Artificial Intelligence Methods .................................................. 695
F. Michael Chang

O. Hendriko, Emmanuel Duc and Gandjar Kiswanto

Building a Case Base for the Non-Conformance Problem Solving in the Aluminum Extrusion Process .................................................. 717
N. O. Pacheco, J. C. E. Ferreira and W. L. Mikos

Framework of Optimization of Transport Process with Use of Intelligent Hybrid System .................................................. 729
Kubiak Natalia and Agnieszka Stachowiak

A New Collaborative Filtering-Based Recommender System for Manufacturing AppStore: Which Applications Would be Useful to Your Business? .................................................. 737

Real-Time Tracking System for a Moored Oil Tanker: A Kalman Filter Approach .................................................. 749
Paulo Malheiros, Paulo Rosa-Santos, José Gonçalves, Paulo Costa, António Paulo Moreira, Fernándo Veloso-Gomes and Francisco Taveira-Pinto

Managing Automation Development Projects: A Comparison of Industrial Needs and Existing Theoretical Support .................................................. 761
A. Granlund and M. Jackson

Issues Affecting Advanced Manufacturing Technology Projects .................................................. 775
Josef Hynek and Václav Janeček

Part III Manufacturing Operations Management and Optimisation

A Reference Model for a Synchronized and Dynamic Alignment of the Order Fulfilment Process .................................................. 787
Thomas Wochinger, Frank Zwißler and Engelbert Westkämper
Closed-Loop Sustainable Supply Chain Design Under Uncertainties ........................................... 799
Li-Chih Wang, Tzu-Li Chen, Yin-Yann Chen, Yi-Wen Chen and Allen Wang

An Integrated Production and Distribution Scheduling Approach for Exceptions Handling .................. 813
Esther Álvarez, Eneko Osaba, Luis Villalón and Fernando Díaz

Performance Framework Geared by a Proactive Approach ........ 825
António Almeida and Américo Azevedo

Application of Non-conformity Matrix to Predict System Interactions in Complex Quality Problems .................... 839
S. M. O. Tavares, Arsalan Farooq, António Araújo and Henriqueta Nóvoa

Nonconformity Root Causes Analysis Through a Pattern Identification Approach ............................... 851
Michael Donauer, Paulo Peças and Américo Azevedo

Downtime Model Development for Evaluating Operational Performance of Workover Activities in AGOCO .................. 865
Haitham Mansour, Munir Ahmed and Ghaith Abdulrahman

Potential Using of OEE in Evaluating the Operational Performance of Workover Activities ......................... 877
Haitham Mansour, Munir Ahmad and Hussain Ahmed

Operating Curves of Manufacturing Systems: A Theoretical Discourse ............................................. 887
Gerald Weigert

Elaboration of Reference Models for Improving Enterprise Performance .................................................. 899
Paul Eric Dossou and Philip Mitchell

Process Performance Assessment in Collaborative Manufacturing Environments: A Role Oriented Approach .......... 911
António Almeida, Filipe Ferreira, Américo Azevedo and Álvaro Caldas
Measuring Job Satisfaction of Shift Workers Based on Fuzzy Systems Approach .................................................. 925
Tuğşen Hatipoğlu, Mehlika Kocabaş, Atakan Alkan and Ahmet Cihan

Performance Heterogeneity Within a Group: An Empirical Study .............................................................. 935
R. Folgado, P. Peças and E. Henriques

Gender Equality in Entities Setup in Spanish Science and Technology Parks .............................................. 947
Mª Pilar Latorre-Martínez, Luis Navarro-Elola and Tatiana íñiguez-Berrozpe

A Model to Increase Customer Loyalty by Using Bi-directional Semantic Interference: An Application to White Goods Industry ................................................................. 961
Deniz D. Diren, Alper Göksu, Tuğşen Hatipoğlu, Hatice Esen and Alpaslan Fiğlali

A Study into Composite Laminators’ Motivation ............................................... 971
Dennis Crowley, Carwyn Ward, Kevin Potter, Oksana Kasyutich, Kevyn Jonas and Nigel Jennings

Relationships of Factors in a Manual Assembly Line Environment .............................................................. 985
Jaakko Peltokorpi, Sampsa Laakso, Juho Ratava, Mika Lohtander and Juha Varis

Clustering for Decision Support in the Fashion Industry: A Case Study .................................................... 997
Ana Monte, Carlos Soares, Pedro Brito and Michel Byvoet

Competence-Based Planning of Coupled Process Chains ................................................................. 1009
Berend Denkena, Friedrich Charlin and Helge Henning

Social Media in Manufacturing: Just Hype or Concrete Benefits? .............................................................. 1023
M. Lanz and S. Torvinen

RFID Implementation in the Footwear Supply Chain: From Production Line to Retail Store and Back .................. 1035
Ana C. Barros, Rui Rebelo, Pedro França, João Sousa, José Rios, Ana Gomes, Paulo Monteiro and Guirish Vaguela
Costs of Inbound Logistics: Towards a Decision Support Model for Production System Design ........................................ 1049
Christina Windmark and Carin Andersson

PCB Assembly in a Multi-Machine Flowshop with Dynamic Board Release Times ...................................................... 1063
M. T. Yazdani Sabouni and Rasaratnam Logendran

A Multi-Agent Architecture Framework to Improve Wine Supply Chain Coordination ................................................. 1077
Vikas Kumar, Supalak Akkaranggoon, Jose A. Garza-Reyes, Luis Rocha-Lona, Archana Kumari and Yuan Hsin Wang

Green Procurement in Trading Sector of Hong Kong .................. 1089
Janiz H. Y. Heung, T. N. Wong and L. H. Lee

Resource Allocation in the Paced Assembly of Customer Specific Goods ................................................................. 1103
Kirsten Tracht and Lars Funke

Injection Mold Maintenance Scheduling with Mold-Lifting Crane Consideration ......................................................... 1117
C. S. Wong, F. T. S. Chan and S. H. Chung

A Multi-Agent System to Solve a New Formulation of Machine Layout Problem ....................................................... 1129
Ghaith Manita and Ouajdi Korbaa

Organizational Procedures for the Integration of Process Planning and Scheduling in Job-Shop Manufacturing ................. 1141
Sascha Häckel, Jan Keidel and Thomas Kehrer

Intelligent Scheduling for Manufacturing Systems: A Case Study ................................................................. 1153
K. Efthymiou, A. Pagoropoulos and D. Mourtzis

Application of Firefly Metaheuristic Algorithm for the Single Row Facility Layout Problem ...................................... 1165
Özlen Erkal Sönmez and Ş. Alp Baray

Geometrical Optimization of Micro-Mixer with Wavy Structure Design for Chemical Processes Using Taguchi Method ............................................................... 1173
Nita Solehati, Joonsoo Bae and Agus P. Sasmito
<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Multi-Agent Self-Adaptive Architecture for Outsourcing Manufacturing Supply Chain</td>
<td>1185</td>
</tr>
<tr>
<td>Sushma Kumari, Akshit Singh, Nishikant Mishra and Jose Arturo Garza-Reyes</td>
<td></td>
</tr>
<tr>
<td>Inventory Based Multi-Item Lot-Sizing Problem in Uncertain Environment: BRKGA Approach</td>
<td>1197</td>
</tr>
<tr>
<td>Felix T. S. Chan, R. K. Tibrewal, Anuj Prakash and M. K. Tiwari</td>
<td></td>
</tr>
<tr>
<td>Part IV Manufacturing Organization and Strategies</td>
<td></td>
</tr>
<tr>
<td>Challenges for Better Sustainable Manufacturing</td>
<td>1209</td>
</tr>
<tr>
<td>Lihui Wang and Z. M. Bi</td>
<td></td>
</tr>
<tr>
<td>The Power of Analytical Approaches Towards the Development of Differentiated Supply Chain Strategies: Case Study</td>
<td>1223</td>
</tr>
<tr>
<td>Alexander A. Kharlamov, Luis Miguel D. F. Ferreira and Janet Godsell</td>
<td></td>
</tr>
<tr>
<td>Technology Policy for Promoting Environmental Sustainability in SMEs: Issues and Considerations for Effective Implementation</td>
<td>1237</td>
</tr>
<tr>
<td>David A. Wyrick, Ganapathy Natarajan and Chinweike I. Eseonu</td>
<td></td>
</tr>
<tr>
<td>Proposal of a Deliberate Discovery-Learning Approach to Building Exploration Capabilities in a Manufacturing Organization</td>
<td>1249</td>
</tr>
<tr>
<td>Yuji Yamamoto</td>
<td></td>
</tr>
<tr>
<td>Design of Multi-Stage Manufacturing Networks for Personalized Products Using Metaheuristics</td>
<td>1263</td>
</tr>
<tr>
<td>D. Mourtzis, M. Doukas, F. Psarommatis and N. Panopoulos</td>
<td></td>
</tr>
<tr>
<td>New Business Models Elements Oriented to Product-Service Machinery Industry</td>
<td>1277</td>
</tr>
<tr>
<td>Américo Azevedo and Henrique Ribeiro</td>
<td></td>
</tr>
<tr>
<td>Reference Model Framework for Production of Small Series of Innovative and Fashionable Goods in Manufacturing Networks</td>
<td>1291</td>
</tr>
<tr>
<td>Andrea Zangiacomi, Rosanna Fornasiero, João Bastos, Américo Azevedo, Valentina Franchini and Andrea Vinelli</td>
<td></td>
</tr>
</tbody>
</table>
Customer Service in Supply Chain Management:
A Case Study ....................................................... 1305
Fatiha Naoui

Strategic Fit Assessment for Value-Added Networks
of Electric Engine Production ................................. 1323
Carsten Nee, Achim Kampker and P. Burggräf

Analysis of the Network of Relations of Organizations
Set up at Walqa Technology Park .............................. 1335
Mª Pilar Latorre-Martínez, Luis Navarro-Elola,
Jesús Pastor-Tejedor and Tatiana ñiguez-Berrozpe

Distributed Manufacturing System in a Multi-Agent Approach:
An Application for Oil Field Management ................. 1347
A. P. M. Tanajura, V. L. C. Oliveira, H. A. Lepikson
and F. G. M. Freires

Part V Lean and Six Sigma Applications

Exploiting Augmented Reality in Lean Manufacturing:
Opportunities and Challenges ............................... 1361
Francesco Capozzi and Marco Sacco

Performance Measurement for Efficient Lean Management .... 1375
Jiri Tupa

Lean Management Methods in Product Development:
A Case Study ....................................................... 1385
Daniel Soares, João Bastos, Diana Gavazzo, João Paulo Pereira
and A. J. Baptista

Analysis of the CSFs of Lean Tools and ERP Systems
in Improving Manufacturing Performance in SMEs .......... 1401
Osama Alaskari, M. Munir Ahmad and Ruben Pinedo-Cuenca

The Impact of Autonomy on Lean Manufacturing Systems .... 1413
Hanna Theuer, Norbert Gronau and Sander Lass

How to Foresee and Measure the Real Economic Impact
of a Lean Manufacturing Implementation ................... 1425
Leonardo Rivera and Diego F. Manotas
Setup Performance Indicators: A Tool to Systematize and Standardize the Setup Process Diagnosis .......................... 1437
J. Morgado, P. Peças, A. Jorge, E. Henriques, R. Cernadas and S. Furtado

Kanban Principle Training Game “Kanban Bar” ................. 1451
Barbora Sramkova, Lukas Fiedler, Martin Januska, Jiri Kudrna and Lucie Stastna

Using the Six Sigma DMAIC Methodology to Improve an Internal Logistic Process ................................................................. 1461
Luís Miguel D. F. Ferreira, Cristóvão Silva and Carolina Mesquita

Lean Six Sigma Supply Chain Case Study: Aircraft Shipment Improvement in a Pharmaceutical Company .................. 1475
Luís Rocha-Lona, Silvia Edith Alvarez-Reyes, Steve Eldridge, Jose Arturo Garza-Reyes and Vikas Kumar

A Comparative Study of the Implementation Status of Lean Six Sigma in South Korea and the UK .................. 1489
Joong Hwa Lee, Jose Arturo Garza-Reyes, Vikas Kumar, Luis Rocha-Lona and Nishikant Mishra

Darren Winter, Chris Jones, Carwyn Ward, Paul Gibbons, Chris McMahon and Kevin Potter

Applying Value Stream Mapping to Identify and Evaluate Waste in a Company of the Ceramic Sector .................. 1515
L. B. Luna, P. E. D. Klökner and J. C. E. Ferreira

Specific Strategies for Successful Lean Development Implementation ........................................................ 1527
Uwe Dombrowski, David Ebentreich and Kai Schmidtchen

Adaptation of Lean in the Wood Industry .......................... 1539
Urs Buehlmann, Omar Espinoza and Christian Fricke
Simulation Studies of Hybrid Pull Systems of Kanban and CONWIP in an Assembly Line .............................. 1553
Yue Huang, Hung-da Wan, Glenn Kuriger and F. Frank Chen

Value Stream Mapping Application on Mould Making Industry: Results and Discussion .............................. 1565
A. Costa, E. Henriques, M. Domingues and P. Peças

Implementation of Lean Principles in a Food Manufacturing Company ....................................................... 1579
Ian Kennedy, Andrew Plunkett and Julfikar Haider

The Use of Lean Pull Strategy and Simulation in Solving Total Laboratory Automation Problem ...................... 1591
T. Yang and T. K. Wang

Part VI Energy Efficiency in Factory Life Cycle

Dual Energy Signatures Enable Energy Value-Stream Mapping ................................................................. 1603
Egon Müller, Timo Stock and Rainer Schillig

Practical Approach to Analyze and Optimize Energy Efficiency Within a Press Hardening Process .................. 1613
Horst Meier, Dennis Bakir and Björn Krückhans

Methodical Approach to Identify Energy Efficiency Measures in Factory Planning Based on Qualitative Analysis 1627
Egon Müller, Manuela Krones and Jörg Strauch

Evaluation of Process Chains for an Overall Optimization of Manufacturing Energy Efficiency ...................... 1639
Christian Mose and Nils Weinert

Green Cycle Factory ................................................................................................................................. 1653
Dominik Rohrmus, Volkmar Döricht, Nils Weinert, Jens-Christian Holst and Christoph Kiener
Visualization of Energy: Energy Cards Create Transparency for Energy-Efficient Factories and Processes .......................... 1665
Hendrik Hopf and Egon Müller

Sustainability Performance Indicators for Supporting the Realization of Sustainable and Energy-Efficient Manufacturing ............................................. 1677
Tapaninaho Mikko, Koho Mikko, Nylund Hasse, Heilala Juhani and Torvinen Seppo

Author Index ................................................................. 1689
Advances in Sustainable and Competitive Manufacturing Systems
23rd International Conference on Flexible Automation & Intelligent Manufacturing
Azevedo, A. (Ed.)
2013, XXIII, 1693 p. 611 illus., 379 illus. in color. In 2 volumes, not available separately. Softcover
ISBN: 978-3-319-00556-0