

TABLE OF CONTENTS

Foreword	7
Univ.-Prof. Dr.-Ing. habil. Prof. E. h. Dr. h. c. mult. Michael Schenk Institute of Logistics and Material Handling Systems Otto von Guericke University Magdeburg, Germany	
Prof. h. c. Dr.-Ing. Dr. h. c. (UCLV) Elke Glistau Institute of Logistics and Material Handling Systems Otto von Guericke University Magdeburg, Germany	
Introducing the Universities	9
Scientific Papers	21
<i>The mathematical and ontology model of the Two-Echelon Vehicle Routing Problem with Time Window</i>	23
M. Sc. Anita Agárdi Department of Information Technology University of Miskolc, Hungary	
Prof. Dr. László Kovács Department of Information Technology University of Miskolc, Hungary	
Dr. Tamás Bányai Institute of Logistics University of Miskolc, Hungary	
<i>Proposal of key performance indicators system for the selected processes of logistics</i>	31
Ing. Tomáš Brlej Institute of Industrial Engineering and Management Slovak University of Technology in Bratislava, Slovakia	
Doc. Ing. Alena Pauliková, PhD Institute of Industrial Engineering and Management Slovak University of Technology in Bratislava, Slovakia	
Ing. Martin Mareček-Kolibický Institute of Industrial Engineering and Management Slovak University of Technology in Bratislava, Slovakia	
Doc. Ing. Marta Kučerová, PhD Institute of Industrial Engineering and Management Slovak University of Technology in Bratislava, Slovakia	

Industry 4.0 and lean manufacturing: A conceptual model for its integration into the cement industry **37**

MsC. Lissette Concepción Maure
Industrial Engineering Department
Central University from Las Villas, Cuba

DrC. René Abreu Ledón
Industrial Engineering Department
Central University from Las Villas, Cuba

Prof. Dr.-Ing. Dr. h.c. Norge Isaias Coello Machado
Mechanical Engineering Department
Central University from Las Villas, Cuba

Prof. h. c. Dr.-Ing. Dr. h. c. (UCLV) Elke Glistau
Institute of Logistics and Material Handling Systems
Otto von Guericke University, Germany

Smartbin development for cyber-physical waste collection **45**

M. Sc. Ákos Cservenák
Institute of Logistics
University of Miskolc, Hungary

Dr. Tamás Bányai
Institute of Logistics
University of Miskolc, Hungary

Analysis and improvement of the warehouse of finished products in rum factory **49**

Ing. Ernesto González Cabrera
Industrial Engineering Department
Universidad Central "Marta Abreu" de Las Villas, Cuba

DrC. Roberto Cespón Castro
Industrial Engineering Department
Universidad Central "Marta Abreu" de Las Villas, Cuba

Prof. Dr.-Ing. Dr. h.c. Norge Isaias Coello Machado
Mechanical Engineering Department
Universidad Central "Marta Abreu" de Las Villas, Cuba

Prof. h. c. Dr.-Ing. Dr. h. c. (UCLV) Elke Glistau
Institute of Logistics and Material Handling Systems
Otto von Guericke University, Germany

Fleet management challenges of the next generation of bike-sharing system with autonomous cargo-bikes 55

M. Sc. Imen Haj Salah
Institute of Logistics and Material Handling Systems
Otto von Guericke University Magdeburg, Germany

Blockchain and Logistics 4.0 61

M. Sc. Ibolya Hardai
Institute of Logistics
University of Miskolc, Hungary

Prof. Dr. habil. Béla Illés
Institute of Logistics
University of Miskolc, Hungary

Dr. Ágota Bányai,
Institute of Logistics
University of Miskolc, Hungary

Development and evaluation method for innovative material provision systems and the associated handling processes in the automotive industry 69

M. Sc. Benedikt Hoffmann
Projekt Innovation und Industrie 4.0
BMW Group, Germany

B. Sc. Michael Axenbeck
Projekt Innovation und Industrie 4.0
BMW Group, Germany

Use of a markerless augmented reality system for geometric validation: user study 75

M. Sc., M. Sc. Benjamin-Paul Jesche
Virtual Validation
Commercial Vehicles, Volkswagen Aktiengesellschaft, Germany

Empirical analysis of learning effects in lead-time

83

Dipl.-Ing. Yalili Rodríguez Romero
Industrial Engineering Department
Universidad Central "Marta Abreu" de Las Villas, Cuba

Dr. Roberto Cespón Castro
Industrial Engineering Department
Universidad Central "Marta Abreu" de Las Villas, Cuba

Prof. Dr.-Ing. Dr. h.c. Norge Isaias Coello Machado
Mechanical Engineering Department
Universidad Central "Marta Abreu" de Las Villas, Cuba

Prof. h. c. Dr.-Ing. Dr. h. c. (UCLV) Elke Glistau
Institute of Logistics and Material Handling Systems
Otto von Guericke University, Germany

Application of queuing theory in development of storage system of flexible manufacturing

91

M. Sc. Oleksii Serdiuk
Joint Stock Company "FED",
Department of Theoretical Mechanics and Engineering and Robotic Systems
National Aerospace University "Kharkiv Aviation Institute", Ukraine

Prof. Dr. Oleg Baranov
Department of Theoretical Mechanics and Engineering and Robotic Systems
National Aerospace University "Kharkiv Aviation Institute", Ukraine

Dr. Nataliya Rudenko
Department of Theoretical Mechanics and Engineering and Robotic Systems
National Aerospace University "Kharkiv Aviation Institute", Ukraine

Robotic bicycle parking with autonomous electric power system

97

M. Sc. Dmytro Shtanko
Department of Theoretical Mechanics and Engineering and Robotic Systems
National Aerospace University "Kharkiv Aviation Institute"

Dr. Yurii Shyrokyi
Department of Theoretical Mechanics and Engineering and Robotic Systems
National Aerospace University "Kharkiv Aviation Institute"

Dr. Nataliya Rudenko
Department of Theoretical Mechanics and Engineering and Robotic Systems
National Aerospace University "Kharkiv Aviation Institute"

Evaluating logistics processes – A comparison between intralogistics and urban transport systems 103

M. Sc. Franziska Thomas
Institute of Logistics and Material Handling Systems
Otto von Guericke University, Germany

Univ.-Prof. Dr.-Ing. Hartmut Zadek
Institute of Logistics and Material Handling Systems
Otto von Guericke University, Germany

Make-Or-Buy and current trends 109

Dr.-Ing. Sebastian Trojahn
Institute of Logistics and Material Handling Systems
Otto von Guericke University, Germany

Prof. h. c. Dr.-Ing. Dr. h. c. (UCLV) Elke Glistau
Institute of Logistics and Material Handling Systems
Otto von Guericke University, Germany

Prof. Dr.-Ing. Dr. h.c. Norge Isaias Coello Machado
Mechanical Engineering Department
Universidad Central "Marta Abreu" de Las Villas, Cuba

Lisa Mai, M. Sc.
bayme vbm - die Arbeitgeberverbände der bayrischen Metall-
und Elektroindustrie in Coburg, Germany

Solution approach for the detection of adjustment requirements in logistics standard processes 115

M. Eng. Stephanie Weindl
Technology Centre for Production and Logistics Systems
Landshut University of Applied Sciences, Germany

Prof. Dr. Markus Schneider
Technology Centre for Production and Logistics Systems
Landshut University of Applied Sciences, Germany

The impact of operational flexibility on companies' performance: evidence from small and medium-sized pharmaceutical companies in Iran **121**

M. A. Allam Yousuf
Institute of Applied Informatics and Logistics
University of Debrecen, Hungary

M. A. Vahid Zeynvand Lorestani
Institute of Management/ Faculty of Economics and Business
University of Debrecen, Hungary

Dr. János Felföldi
Institute of Applied Informatics and Logistics
University of Debrecen, Hungary

Committee of Reviewers **127**

List of Authors **128**

Impressum **130**