

## Preface

The annual series of Global Conferences on Sustainable Manufacturing (GCSM) sponsored by the International Academy for Production Engineering (CIRP) is committed to excellence in the creation of sustainable products and processes, which conserve energy and natural resources, have minimal negative impact upon the natural environment and society, and adhere to the core principle of sustainability by considering the needs of the present without compromising the ability of future generations to meet their own needs. To promote this noble goal, there is a strong need for greater awareness in education and training, including dissemination of new knowledge on principles and practices of sustainability applied to manufacturing. The series of Global Conferences on Sustainable Manufacturing offers international colleagues opportunity to build effective relationships, expand knowledge, and improve practice globally.

Every year, a country is selected to host the Global Conference on Sustainable Manufacturing, building effective links among the international colleagues, expanding their knowledge, and improving their practice globally. Conferences in this series have previously been held at different countries and locations: At Masdar Institute of Science and Technology, Abu Dhabi University, United Arab Emirates in November 2010, at the Indian Institute of Technology Madras, India in December 2009, at the Pusan National University, Korea in October 2008, at the Rochester Institute of Technology, Rochester, USA in September 2007, at the University of Sao Paulo, Brazil in October 2006, at the Jiao Tong University, Shanghai, China in October 2005, at the Technische Universität Berlin, Germany in September 2004, and in the form of a workshop on Environmentally Benign Manufacturing held in Birmingham, Alabama, USA, in January 2003.

In September 28th – 30th, 2011, St. Petersburg State University of Economics and Finance, and St. Petersburg State Polytechnical University, Russia in cooperation with Vodokanal of St. Petersburg, Russia host the 9th Global Conference on Sustainable Manufacturing under the patronage of Prof. D.Sc. (Phys., Math.) Zhores I. Alferov Vice-President of the Russian Academy of Sciences, Inventor of the heterotransistor and the winner of 2000 Nobel Prize in Physics.

Modern Russia is a strong and rapidly developing state implementing the best of international practices on the fundament of its own rich historical experience. Russian economy aspires for sustainable and innovative advance together with its continental and overseas partners. St. Petersburg being a significant metropolis and business center of Russia welcomes international partners for work and for fruitful exchange of ideas.

Participants from all over the world come together for presenting their research results in sustainable engineering. Contributions are clustered in value creation by sustainable manufacturing, manufacturing processes and equipment, remanufacturing, reuse and recycling, product design for resource efficiency and effectiveness, innovative energy conversion, green supply chain and transportation, adequate environments for entrepreneurial initiative, education for sustainability engineering, and economics for sustainability and development. Tours to industrial companies in the region of St. Petersburg have been arranged to give an impression of the Russian approaches in value creation.

The 9th Global Conference on Sustainable Manufacturing (9GCSM) is geared towards representatives of science and industry from different continents. The conference serves as a forum for international research institutes and industrial companies related to the area of sustainable manufacturing. The conference offers keynote speeches, panel discussions, expert sessions and a poster forum. Discussions and exchange of ideas between the participants are an integral part of the meeting.

This book includes the research papers, which have been accepted at the 9th Global Conference on Sustainable Manufacturing. These contributions are structured in nine chapters covering areas: Value Creation by Sustainable Manufacturing; Manufacturing Processes and Equipment; Remanufacturing, Reuse and Recycling; Product Design for Resource Efficiency and Effectiveness; Innovative Energy Conversion; Green Supply Chain and Transportation; Adequate Environments for Entrepreneurial; Engineering Education for Sustainability; and Economics for Sustainability Development.

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