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EDITORIAL

Editorial

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The growing complexity in today's production networks calls for transdisciplinary approaches towards robustness in manufacturing.Taking up this topic, the international conference on "Robust Manufacturing Control-Innovative and Interdisciplinary Approaches for Global Networks" (RoMaC 2012) was held on the campus of Jacobs University in Bremen, Germany. The conference was sponsored by the International Production Engineering Academy (CIRP) and the Alfried Krupp von Bohlen und Halbach-Foundation.

The logistic target achievements in Global Production Networksare deeply influenced by multi-scale changes such as:

- sudden and unexpected large-scale changes of important parameters which occur more frequently
- event propagation in networks with high degree of interconnectivity which leads to unforeseen fluctuations
- non-equilibrium states which increasingly characterize daily business

Robust planning and control strategies that integrate insights of the cause and effect of multi-scale changes in production networks enable robustness in respect of stabilizing and sustaining systems performance. New methodological approaches from different science disciplines are promising to contribute to a new level comprehension of network processes. Unconventional methods from biology, perturbation ecology or auditory display are gaining increasing importance as they are confronted with similar challenges. Advancements from the classical disciplines such as mathematics, physics and engineering are of continuing importance.Seven papers have been carefully selected to give insights into the four sub-categories for robustness in manufacturing.

The first two papers deal with *interdisciplinary approaches* for robustness in manufacturing. Thereby, Beber et al. showed that strong parallels exist between manufacturing and metabolic systems. Hence, the methods from systems biology can be applied in manufacturing and offer possibilities to analyze and describe system robustness.In order to identify causes and impacts of certain parameters in complex manufacturing networks, the tool of Iber et al. analyses manufacturing feedback data with methods from auditory display, which exceeds the possibilities of graphical analysis.

The third paper of Duffie et al. presents a method to coordinate multiple modes of capacity adjustment in work systems. Under use of *autonomous control* this concept enables manufacturers to keep their high performance in today's unpredictable market conditions, thus to increased robustness of the systems.

How to *increase the robustness in manufacturing networks* is handled in the paper of Papakostas et al. that proposes a novel decision-making approach to support the configurationof a dynamic manufacturing network. Moreover, Mourtziset al. addresses questions of decentralized manufacturing, specifying the main trends, issues, and sensitive topics that characterize the behavior and performance of such production systems.

The last two papers present *mathematical models for process optimization and strategic approaches towards robustness*. The study of Hosokawa et al. proposes new trading mechanisms in decentralized electricity trading in

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order to stabilize the grid system and to create a social surplus. Finally, based on a partial differential equation model the paper of Armbruster et al. introduces a continuum description of the product flow through the factory.

The chosen papers represent the broad range of topics that deal with robust manufacturing. From my perspective these papers stand for a representative election of topics within the scope of RoMaC. Nevertheless, I would like to express my gratitude to all authors contributing to the conference and making this event successful.

With the CIRP-sponsored RoMaC 2012 conference, RoMaC will gain more importance as a topic on its own and I am convinced that particularly in combination with interdisciplinary approaches, RoMaC will get further consideration in theory and practice in the future.