Minisymposium *Mathematical Models for Supply Chains*

S. Göttlich and A. Klar

TU Kaiserslautern, Department of Mathematics, Postfach 3049, 67653 Kaiserslautern, Germany, goettlich@mathematik.uni-kl.de, klar@itwm.fraunhafer.de

Modeling of supply chains covers a broad mathematical spectrum which allows for application-oriented as well as more theoretical results. Nowadays, where simulation and optimization issues are of interest, mathematicians, engineers and economists focus on the computational validation of those models. From a mathematical point of view, one can mainly distinguish two classes of models: continuous and discrete ones. The latter are either common in particle-based simulations of complex production systems or optimization problems. However, continuous models are used for the simulation of large-scaled supply chains where not only feasible solutions and predictions come first but also fast computing times. The following articles exactly pick up all these features and contribute new and current results in this direction.

Ute Ziegler, from RWTH Aachen University, presents a discrete optimization model which supports the decision-making process in planning new production lines. The objective therein is to minimize investment, production and transportation costs while a multiple set of time-dependent constraints must be fulfilled. To find feasible and optimal solutions, several starting heuristics are implemented and efficiently tested on sample examples.

Simone Göttlich et al. describe a continuous model based on a coupled set of ordinary differential equations involving customer demands, order policies and money flows. The reformulation as an ODE-restricted optimization model has been proposed to determine suitable order and distribution strategies. It is furthermore shown that maximizing the profit of liquid suppliers in this model is independent of internal pricing and does not effect any policies.

Kathrin Padberg, from TU Dresden, and her co-workers focus on rate equations propagating material flows in push or pull (supply or demand-oriented) supply chains. The performance of a stability analysis provides the well-known Bullwhip effect (oscillating demand blow-up) as a mathematical instability which can be only prevented by a mixed push-pull-strategy.

Laurent Navoret, from the Université Paul Sabatier of Toulouse, and his collaborators concentrate on the interdisciplinary issue of economics and

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biology. The idea is to analyze the limiting procedure from microscopic (fine scale) to macroscopic (coarse scale) congestion models. Using the movement of sheep herds as example, where transition regimes from dilute to gregarious phases play an important role, the authors point out possible links for ongoing research in the field of supply chains.

Marco Laumanns, from ETH Zurich, describes a stochastic optimization model for transshipments of goods under uncertain demand in inventory-distribution networks. The question is how to choose a cost-effective alternative of either additional transportation costs or high inventory costs. One way to quantify this relation is to determine optimal control policies for each alternative and to compute the resulting average cost savings under these policies as the value of the transshipment option.