Master Thesis

Solution approaches for uncertain scrap rates in the CLSP-L-B

Mannheim, 2021

Lot-size decisions are pressured by uncertain scrap rates in production. The underlying mixed integer problem (CLSP-L-B) is not able to work with uncertain scrap rates.

Prerequisites:

- Knowledge in discrete optimization for MILPs
- Programming language skills: Python
- Basic knowledge about production planning (lot-sizes, capacity planning, bill of materials)

Related literature:

- Uncertainty Framework for uncertainty incorporation:
  - Acar, Yavuz, Sukran N. Kadipasaoglu, and Jamison M. Day. "Incorporating uncertainty in optimal decision making: Integrating mixed integer programming and simulation to solve combinatorial problems." Computers & Industrial Engineering 56.1 (2009): 106-112.
- CLSP related literature (CLSP-L-B formulation is provided on next slide):
  - Buschkühl, Lisbeth, et al. "Dynamic capacitated lot-sizing problems: a classification and review of solution approaches." Or Spectrum 32.2 (2010): 231-261.
  - Quadt, Daniel, and Heinrich Kuhn. "Capacitated lot-sizing with extensions: a review." 4OR 6.1 (2008): 61-83.
  - Briton, Julien, and H. U. T. T. Cédric. "The multi-item capacitated lot-sizing prolem with setup times and additional industrial constraints." *IFAC Proceedings Volumes* 39.3 (2006): 107-111.

Access to content:

- Mathematical formulation and procedure definitions of the uncertainty framework of *Acar* applied on the CLSP-L-B with uncertain demands
- Simulation engine for demands
- Real-world data set containing scrap rates

Expectations:

- Concept&development simulation engine for scrap rates
- Mathematical formulation and procedure definitions of the uncertainty framework of *Acar* applied on the CLSP-L-B with uncertain scrap rates
- Numerical experiments with real-world data
- Optional: Implementation and showcase with e.g. AIMMS

Supervision:

- Prof. Dr. Stefan Nickel (Lehrstuhl IOR)
- Michael Simonis (Senior consultant at Camelot ITLab, PhD candidate KSRI at KIT)