

Design and Operation of Bag Sorting System

Graduate



Jessica Wencui Huang

Problem: The aim of the bag sorting system is to sort products with high efficiency. Considerations regarding the costs must be counterbalanced in the practice, too. Thus, many questions need to be answered for its design and operation. Most of the intralogistics system's customers in the researched business cases tend to provide large variety of products and different items are dedicated towards different destinations within the process. In the meantime, the end consumers or the next process typically request only small orders with various types of product. Tighter delivery or production schedules with more efficiency and flexibility are required.

Objective: This thesis focuses on the analysis of the special type of the bag sorting system. It aims to achieve operational excellence by uploading, sorting, and distributing products at a warehouse or production site with high efficiency. This system is already being used in large real-world facilities by online retailers, manufacturers, industry laundry or third-party logistics providers. The challenge lies in the high complexity of the decisions that need to be made in the design and the operation of such an intralogistics system regarding its throughput performance and weighing the investment costs. Two key performance indicators (short as KPIs) are set in the simulation model. One is the throughput of the products per hour which represents the sorting performance of the bag sorting system. The other KPI is the cost which primarily depends on the number of buffer lines and the maximal orders in sorting.

Approach: It is time-consuming and costly to design and test such an intralogistics system with high interdependency in the real world. Thus, simulation is a widely used performance evaluation technique in the academic literature and in practice that allows assessment of both design and operational decisions. Simulation provides quick and early feedback that allows people to evaluate and compare the performance of different decisions before actual implementation.

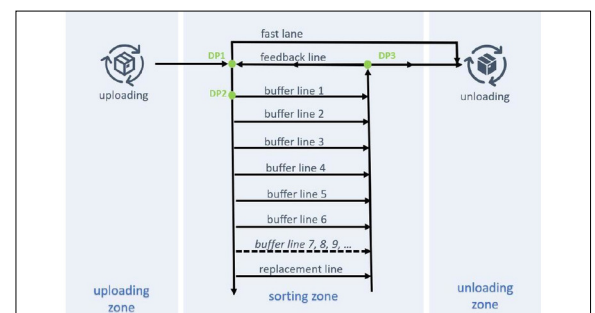
To compare system model with different designs and operations based on the research in the latest realistic business cases, various scenarios are conducted: number of buffer lines, maximal orders in sorting, buffer line capacity, loading interval, stop interval, and items amount per loading group.

Result:

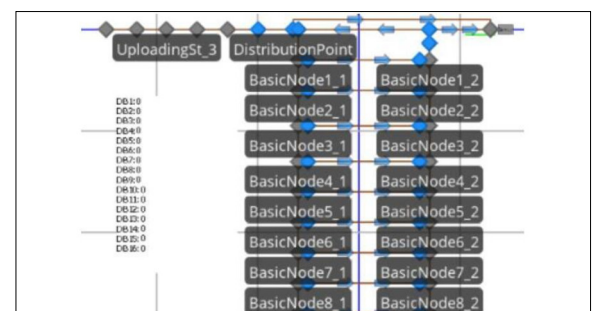
In the bachelor thesis, the author simulates the bag sorting system, runs scenarios with different parameter settings and analyses the corresponding performance in term of the bag sorting system's design and operation after the business cases research on the market. The simulation results are evaluated, feasible and good solutions are proposed. It is shown that, the bag sorting system with 8 buffer lines, 40 orders being sorted in the same time, buffer line capacity as 60 items, loading interval of 5 hours,

stop intervals of 1 hour, and items amount per loading group of 5,000 overperformed the other scenarios with the mentioned general setting in the thesis.

bag sorting system model layout
Own presentation



general simulation model in Simio
Own presentation



Advisor

Dr. Shuangqing Liao

Co-Examiner

Dr. Lukas Budde

Subject Area

Supply Chain Management

Project Partner

Institut für
Produktdesign,
Entwicklung und
Konstruktion IPEK,
Rapperswil, SG