SIMULATION OF AN AUTOMATED ORDER PROCESSING SYSTEM

KUEHNE+NAGEL

INDUSTRY
Logistics

APPLICATION AREA
Automated order processing, material handling and warehousing

COUNTRY
The Netherlands

CHALLENGE
Insight into the system for decision support, safeguarding investments and definition and analysis of capacities and resources. Communicating with suppliers. Analysis and control of order processing.

RESULTS
A user–friendly tool with a meaningful 3D visualization for a deep insight into the system's performance and operations.

THE KEY TO SUCCESS
Well–founded decisions for or against investments can be made in an early planning stage by using simulation software. This results in enormous time and cost savings.

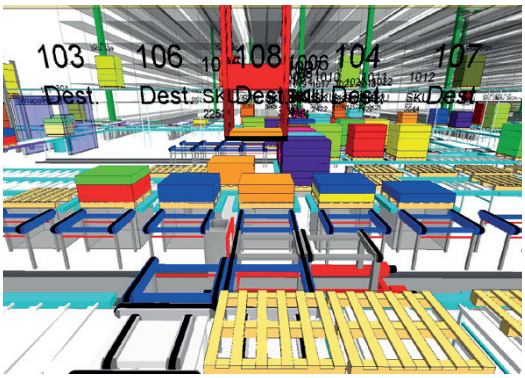
Kuehne + Nagel simulates the automation of an order processing system with Enterprise Dynamics® and uses the simulation model for capacity analysis and communication with suppliers.

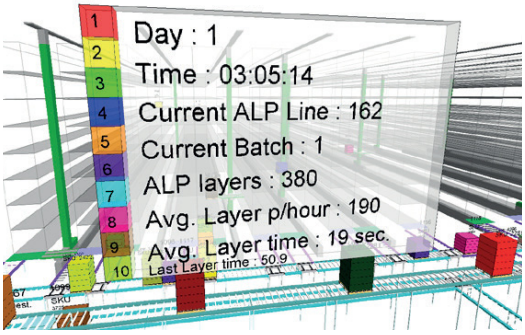
KUEHNE + NAGEL

Kuehne + Nagel ranks among the top three worldwide logistics players and provides solutions in the industries Seafreight, Airfreight, Road & Rail Logistics and Contract Logistics. The organization has about 55,000 employees and has network of 900 offices in more than 100 countries.
In close collaboration INCONTROL supported Kuehne + Nagel in different projects of Kuehne + Nagel in the food retailing market. One of the projects concerned the automation of an order–fulfillment system of customer pallets with the use of "Automated Layer Picking". This project is discussed below.

INTRODUCTION

The project concerned a system for automated order fulfillment of customer order pallets in the food retailing sector. In order to perform this order fulfillment, Kuehne + Nagel proposed the use of an automated storage retrieval system (ASRS) in combination with an automated layer picker (ALP). The ASRS is used to handle and store both full product pallets and customer pallets. Dependant on physical size and weight of the product, a full product pallet consists of layers that contain (e.g. crates of soda). Since the order quantities of the customer orders do not all exactly match to the quantity one these product pallets, customer pallets are assembled by picking a combination of layers of a product pallet ("mother" pallet) to a customer ("daughter") pallet. The combination and sequence of these layers is pre–defined by the customer and also on the physical aspects of the products in these layers. In order to manage the workflow of the ASRS with the ALP an optional pre–sorting buffer was proposed to handle the sequencing and working buffer of the ALP.
In this project the input of the model is a fixed (deterministic) set of order lines (ALP movements) that are handled by the system. This set of order lines is created with a pre–defined algorithm which functions outside the model. Herewith Kuehne + Nagel maintained the flexibility of changing the algorithm without the need of changing the simulation model.





PURPOSE AND CONTENT

INCONTROL was asked to develop a user–friendly simulation model in this project. Like in the first project, the model also contains all relevant settings and is visualized in both 2D and 3D for commercial and communicational reasons. The settings of the simulation model are here:

- Inbound and outbound flow of full product pallets.
- Physical properties of the material handling entities (e.g. conveyor speed, handling speed of ALP)
- Use of capacity (e.g. amount of daughter pallet locations, use of pre–sorter, number of ASRS aisles).
- Input of order lines.

A feature that is used in this simulation model is the 3D visualization of output monitors that show the key performance indicators. In this way the user can also analyze the system performance in a 3D view. In order to do a detailed analysis of the scenario, the following output parameters were exported to Excel:

- Scenario settings
- Statistics (input, output average content) of the several locations (e.g. ASRS, Pre–sorter, inbound conveyor, ALP daughter positions)

The use of a simulation model for the automated layer picker created the following benefits for Kuehne + Nagel. Like in the other project, Kuehne + Nagel was able to make validated decisions concerning the capital intensive resources (e.g. ASRS, ALP, pre–sorters). Since the system did not exist yet and the model was mainly focused on 3D visualization, communication concerning the performance and usefulness of the system with both the customer and the supplier was improved significantly. As stated above, pre–defined order lines were used as input of the model, this gave Kuehne + Nagel the opportunity to keep optimizing the order algorithm without changing the model.

CONCLUSION

With the use of the simulation models Kuehne + Nagel is able to evaluate important design decisions concerning the capacity and order management of the systems. Since the system is not built yet, these decisions can be made early in the design process. This way validated initial investment decisions about capital resources and order management systems to be made.

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