ED Logistics

Products and references

INCONTROL

Simulation Solutions

Version 2.0 - Date: May, 2010

Contents

1. Introduction

Enterprise Dynamics® is a leading simulation platform to design and implement simulation solutions. It allows a problem solver to model virtually any problem and, by experimentation, look for a solution for a given problem or an answer to a specific question.

Most of the problems or questions for which simulation is used are:

- Capacity investigations
- Investment evaluations
- Time-to-Market vs. Costs evaluations

To be able to perform simulation studies, a good simulation platform is required. A good simulation platform does not only provide easy-to-understand modeling capabilities and good visualization features, but it also provides the possibilities for the re-use of previous made models, segments of models, and components used in previously made models.

For the simulation of logistics, production and material-handling processes INCONTROL Simulation Solutions developed ED Logistics. ED Logistics consists out of a specially developed simulation library with ready-to-use simulation objects that are organized according to industry guidelines. With ED Logistics the modeler can speed up the process of model building and report experimentation results in graphs, reports and 3D visualization.

This document describes an overview of the ED Logistics solution. The purpose of this document is to give the reader with little knowledge of simulation and Enterprise Dynamics a good understanding of the capabilities of ED Logistics accompanied by relevant references.

2. ED Logistics

2.1 Overview

ED Logistics, the flagship of the ED product portfolio for the simulation of all kinds of material handling, transportation and production processes comes with a well balanced set of flexible atoms, the so called Logistics Library, which extend a comprehensive pool of components. Users draw on plentiful resources to model the full spectrum from basic modeling up to ambitious custom built solutions. Interfaces to ease data management and various predefined result components are just some of the highlights of ED Logistics.

Some of the many simulation objects in ED Logistics:

- Automated Storage and Retrieval System (ASRS)
- Advanced Transporter (forklift)
- Conveyors (accumulating, non-accumulating, straight, curved)
- Transfer Car
- Advanced Vertical Articulated Robot (AVAR)
- Ground Storage

These objects are developed by specialists in simulation and material handling, transportation and production giving you a head start in modeling your specific environment. The parameters and rules you deal with in real-life are also used in the simulation models so you translate design and reality more easily.

ED Logistics also gives you a realistic 3D visualization making it easier to validate and present your simulation models.

2.2 Manufacturing

In flow line production, the production equipment is laid out in the production sequence. The products usually follow the same route through the system. This type of system is frequently very sensitive to equipment breakdowns, because if one process stops, this stops the entire line. Having stock between each process can reduce this sensitivity. Flow line systems are most useful for medium to long production runs.

With ED Logistics you build your models easily with specific production related simulation objects like:

- Server / Machine
- Assembler
- Stacker
- Queue / Buffer
- Operator

The simulation objects come with easy to understand production related parameters that you can modify to fit your production line.

2.3 Warehousing

The process of planning and operating automated warehouses is characterized by permanently alternating operating requirements. Varied layouts and strategies should already be considered and weighed in the storage planning stages. Foreseeable scenarios are implicated into design and strategies in order to hedge the investment against changing business conditions. Declining life cycle of products enhance the necessity to reorganize existing warehouse structures during the useful live.

ED Logistics comes with simulation objects specific to the simulation of warehouses like:

- Advanced ASRS
- Kanban Bin
- Ground Storage
- Warehouse

These simulation objects allow you to simulate a warehouse in great detail even with high product volumes.

2.4 Logistics

It is often difficult to determine the capacity of a transport system consisting of a number of different conveyors. Simple calculation is mostly impossible due to parameters such as

- the priority rules for side conveyors,
- process times,
- different speeds and
- whether or not the conveyors can accumulate.

Nevertheless, no company embarking on an expansion plan wants to be surprised by the subsequent failure of a transport system to meet the demands on it. This is where ED Logistics turns out to be a very helpful tool with a variety of ready-to-use simulation objects like:

- Accumulating conveyors
- Non Accumulating conveyors
- Speed Changing Conveyors
- Turntable

In addition ED Logistics comes with a comprehensive 2D and 3D visualization environment with which you can present your model to peers and non-technical people.

2.5 Automation

A factory with a bespoke design department is complex to manage because each order consists of a separate project with a unique design and estimated cycle times. The accurate estimation of throughput times is made difficult by orders of different quantities in the factory and different delivery dates. If the delivery does not occur at the planned date, penalty clauses are often applied.

In addition, although the processes are fully automated, it has not been possible to synchronize them precisely; furthermore robots or machines are not completely trouble-free.

ED Logistics comes with many simulation objects to model your factory completely. Simulation objects like:

- Advanced Transporter
- Battery Charging Station
- Elevator
- Advanced Scara Robot
- Portal Crane

And if you need to go beyond modeling and communicate directly to equipment ED Logistics brings you the simulation objects to do that too.

2.6 ED Logistics benefits

ED Logistics provides quantitative insight of a factory or warehouse. Not only allows it you to investigate the current situation to see where improvements can be made, it also assists you in the design phase before anything has been built.

ED Logistics provides insight into future development scenarios for product or business changes and modernizations. Is the chosen layout correct? Do we have enough buffer space? How many transporters do we need? What is the effect of changing operator shifts?

ED Logistics offers solutions and creates a better understanding of the issues within a factory or warehouse of today, but also for tomorrow's expansion plans. Simulation objects and models can be reused to minimize modeling times and the same simulation models can be used as a basis for emulation.

The far better insight and understanding of your factory or warehouse processes combined with the investigation of different expansion scenarios will strengthen the decision making process and allow for improved communication with stakeholders.

3. References

3.1 Introduction

ED Logistics has been used in many projects in factories and warehouses around the world. The projects are as diverse as the world can be. A selection of these projects is described in the next sections.

3.2 Sakura SMART Analysis Tool

Sakura Finetek is an international manufacturer of high quality products for the medical profession. Their products can be used in histopathology laboratories. Adding value by innovation through SMART Automation is part of their global vision.

Laboratory automation has consequences for processes and way of working in existing laboratories. An identified profit consists of the introduction of continuous processes in histopathology laboratories. Important products in these continuous processes are the Tissue-Tek Automation Products. Sakura Finetek was looking for a tool that could support them in identifying and quantifying the effect of automation in their customer's laboratory. The tool should be able to visualize the positive effects and added value of the Tissue-Tek products once introduced in the laboratory.

The use of simulation turned out to be the best solution to make the effects of SMART Automation visible and understandable. INCONTROL has proven to be a company that is capable of building a workflow analysis tool that combines the strength of simulation with an easy to use interface. This resulted in the development of the Sakura SMART Analysis Tool.

SMART Analysis Tool
The objective of the SMART Analysis Tool is that it should support the Sakura local sales offices and distributors in showing the effects of introducing Tissue-Tek Automation products in a laboratory and as such demonstrate it to (potential) customers. Therefore one of the requirements was that the current laboratory situation and the automated situation can be compared in one model. As the tool is used by non simulation experts, the interface should be easy to use.

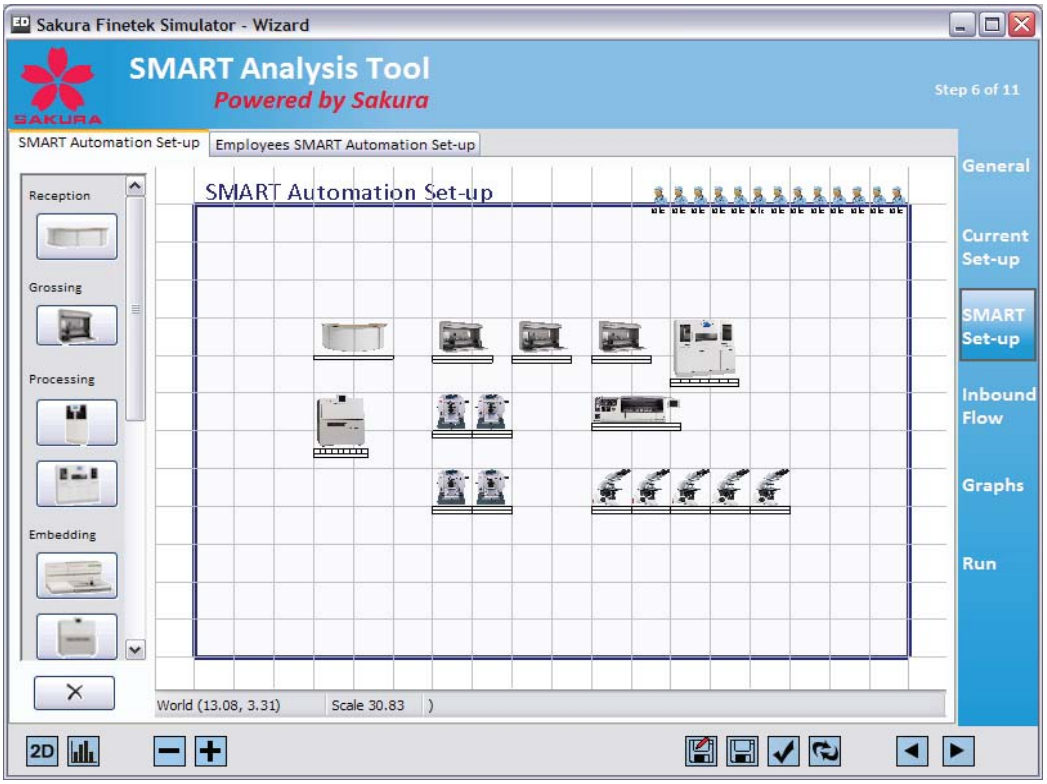
Tissue-Tek Xpress x120 Continuous Rapid Tissue Processor

INCONTROL developed a modeling wizard that guides the user by a step-by-step approach through all relevant modeling steps and parameters. At the end of the wizard the user has built a model that shows the laboratory in current and automated set-up next to each other. Because of the approach that the current and automated set-up can be simulated simultaneously, the tool gives a direct comparison between the two options.

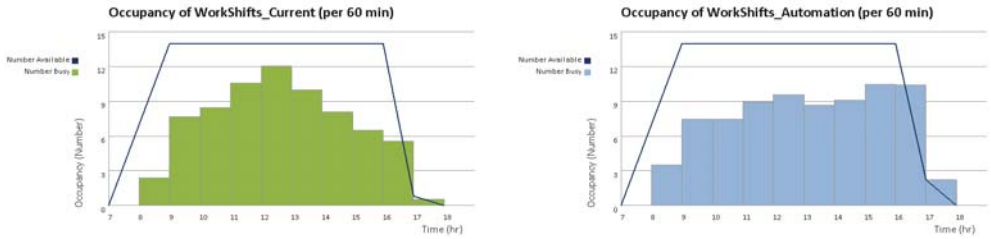
During the simulation run the user can open up the 2D visualization window, to show the workflow in the laboratory. A second window shows the performance of the defined system. A set of parameters and graphs shows a variety of logistic indicators like turnaround times, productivity, utilization of systems and occupancy of laboratory technicians and pathologists.

Tissue-Tek AutoTEC Automated Embedder

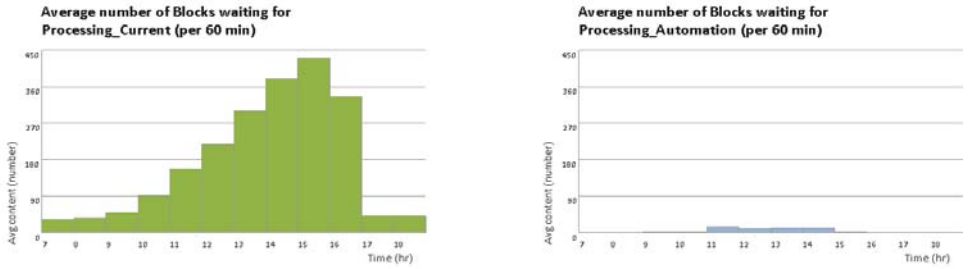
Giving this insight in the laboratory performance, the SMART Analysis Tool will support the Sakura distributors in quantifying thoughts about the benefits of SMART automation. It will contribute to a higher acceptation level of their customers. At the same time the SMART Analysis Tool will give insight in the workflow and performance of the current laboratory situation. In this way the users and customers will gain a better understanding of the current workflow and get a valuable insight in the influence of SMART Automation in their specific laboratory.



The wizard: SMART Automation Set-up



Performance: occupancy of human resources



Performance: buffer contents

3.3 Simulation project Techspace Aero

Aerospace manufacturing is a high technology industry where quality and safety get the highest priority in design and production processes. Last year INCONTROL carried out a simulation project at Techspace Aero, partner of the world's major aerospace engine manufacturers. Techspace Aero designs, develops and produces modules, equipment and test cells for aircraft and space engines.
Their basic activity is the design and manufacturing of modules and components for aero engines, with a particularly strong expertise in low-pressure compressors and high tech parts.

Techspace Aero faces increasing demand volumes in the next years. Therefore they need to expand production capacity and install additional production utilities. A key condition for successful production management is the streamlining of existing production lines, as well as optimal integration of new production utilities.

The logistic performance has to be improved at several points:

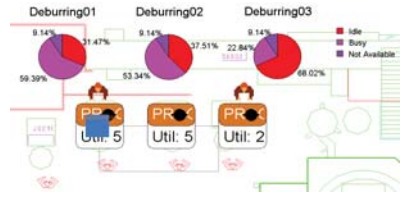
1. Substantially increase production volume
2. Significant reduction of lead times
3. Cost reduction by reduction of work in progress quantities
4. Contribute to organizational and cultural change

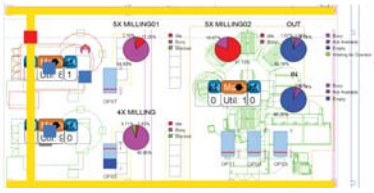
At all times the production quality should be kept at the highest possible levels.

Objective
To meet the described challenges, a number of expansion scenarios were developed for the Fan & Drum manufacturing shop. The production of the fan and drum parts is spread over a range of production stages, including machine and manual operations and several inspections. The complexity of interactions between the production stages makes it difficult to predict which scenario will result in the best performance. The indicators to measure are: productivity (produced parts per week), lead-times per product type, work in progress quantities and utilization rates for machines and operators. The objective for the simulation project was to compare a number of scenarios with different production volumes on these indicators in order to support the manufacturing managers in their decision to implement one of the scenarios.

Scope
The simulation model contains the fan disk and drum production line for the parts GEnx Fan, GP7000 Drum and GP7000 Fan. The production flow is implemented from the start of the line where spare parts are taken from the warehouse until the last inspection step before the parts are sent to the assembly line. Processes like special treatments and processes that are outsourced are implemented as a black box. As the production volume for these parts will vary in the coming years, the defined scenarios contain quantities for the years 2009-2011.

Results
First results from experimentation showed a very high load on some machines. After a reallocation of production steps on these machines the results for production volumes improved significantly.





Further experimentation is done to compare different scenarios for push, pull and mixed push-pull strategies in the line. The mixed push-pull strategy showed a good performance in controlling the number of parts in the line (influencing work in progress and lead-times) and in protecting the bottleneck machines. The objective for these machines was to keep them running all the time, as a missed part there will never come back. The mixed strategy enables Techspace Aero to protect the bottleneck and guarantee the required production targets. The simulation model can be used to define the required quantities in different parts of the line.

Together with the simulation model an interface in Excel has been developed. It enables the user to change input parameters in an easy way, run the simulation and analyze the results in Excel. In the coming years the production volumes per product type will vary from time to time. The model can be used to test the production line if it is possible to produce the different quantities. The influence of breakdowns and reworks can be tested as well as the allocation of production steps on different machines.

3.4 Philips Lighting - Warehouse Simulation

In the complex environment of warehousing, simulation is a good option to test new to build warehouses or changes in the processes of an already existing warehouse. Before spending time and money on new implementations it makes sense to test drive the warehouse with a simulation model. Simulation enables companies to analyze the design of warehouse lay-outs, to predict throughputs and to identify possible bottlenecks in the warehouse process. It supports warehouse managers in their decision if changes are necessary in processes or warehouse layout.

Questions that can be answered with a simulation model are for example:

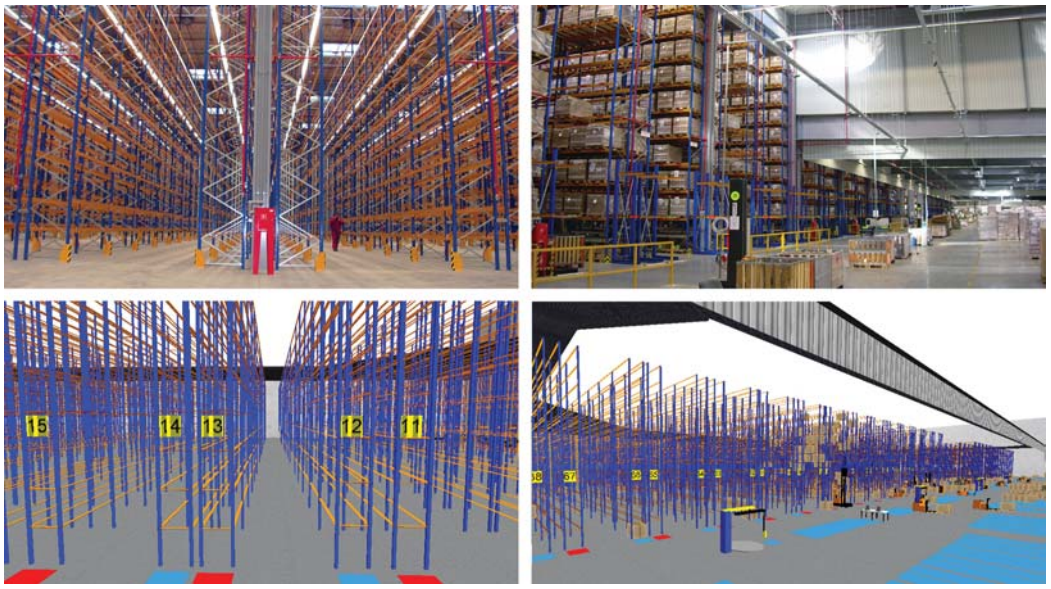
- Will the current warehouse layout be sufficient to handle a particular growth of goods flow in the future?
- How many trucks do we need to achieve a certain productivity level?
- Do processes like parceling or controlling areas have enough capacity?
- Should congestion of trucks be expected in any section of the warehouse?
- How will a different working schedule work out on warehouse performance?
- What picking strategy will result in the highest productivity?

Philips Lighting
Philips Lighting has built a new distribution centre at their site in Acht (Eindhoven). Although calculations on processes had already been made, the management decided to simulate the new warehouse in order to validate the already performed calculations and identify possible bottlenecks in the process. ED Logistics contains standard building blocks, which enable the user to build a warehouse in 2D and 3D environment. This suite is used to build a simulation model of the new warehouse. The model has been built in close cooperation between Philips Lighting Distribution and INCONTROL Simulation Solutions.

Objective
The goal of this simulation project was in the first place to validate the already performed calculations on the required number of reach trucks and order pick trucks. In the second place what-if scenarios where defined to identify possible bottlenecks situations. Further more Philips Lighting wanted to have a 3D representation of the warehouse to use as reference material and educational purposes.

Scope
The model includes the warehouse processes from receiving to put away and from order picking until shipping. Input for the model was defined based on an analysis of historical order patterns. Truck specifications came from the supplier of warehouse equipment and lead times where used for warehouse processes.

One of the questions to answer was to define the required number of reach trucks and order pick trucks in order to handle the flow of inbound and outbound goods. Other questions concerned the capacity of the drop zones, the buffer conveyors between sealing area and shipping lanes and the capacity of shipping and receiving lanes.



Benefits for Philips Lighting
The project's result was a validated simulation model which includes all the described processes. The results of this model gave Philips Lighting more insight in the expected performance of the new warehouse. In short the benefits for Philips Lighting from this simulation project are:

- A validated range of the number of trucks required to handle the inbound and outbound goods flow.
- Indication of congestion in some parts of the warehouse. One of the advices was to spread the concerned product type over more aisles.
- The model showed a bottleneck at the confirmation and sealing area. The advice was to rearrange this area and balance the division in terminals for full pallets and cluster pallets.
- A useful 3D representation of the warehouse.
- Indication that the number of shipping and receiving lanes is stressed, good planning of inbound and outbound flow is required.
- Reduction of 'waiting for replenishment' would improve the performance.
- The simulation model of the warehouse in Acht gives a good starting point to simulate a similar warehouse in Pila (Poland).

3.5 KHS - Simulation Applied for Bottling techniques

In 2004, KHS Maschinen- und Anlagenbau AG, located in Dortmund, Germany, started the selection of a simulation tool for plant layout and planning. KHS Maschinen- und Anlagenbau AG is a global supplier for machines in the beverage industry, ranging from stand-alone machines to complete production lines. After 3 months of market research, tests and interviews with software and solution providers, the decision was made in favor of Enterprise Dynamics (ED).

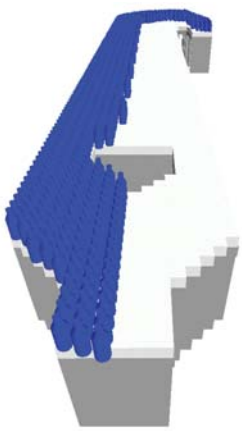
Important specifications for the new simulation software were:

- 2D- and 3D modeling capabilities of new objects
- Powerful process visualization
- Implementation of control logic

These requirements must allow simulation experts at KHS to make effective adjustments to existing production lines or single machines installed in the bottling and packaging industry. The visualization must provide the sales staff and customers with a realistic and easy to understand view of the future system. Furthermore, practical solutions played an important role.

These can be combined in the "end user acceptability" of the simulation software tool. That means that sales people, project planning employees or the customers themselves should be able to run the simulation model and change parameters within the model even without (special) simulation knowledge. In October 2004 the ED software package was officially acquired. After one year of experience with the software, the high demands and wishes at the beginning have been confirmed.

Software implementation and training of was completed quite quickly. Furthermore, a KHS specific modeling library and the standardized use of that library on several PCs have been realized clearly ahead of schedule.



The economic benefit of a simulation tool is difficult to prove before implementation. These include the personal experiences and project usability as well. It is only possible to refer to the successes of other companies and to convince the persons in charge (in-house) of the future success with such a simulation tool. In fact in several past projects, the production line planning was optimized. The resulting effects of capital investment already exceed the implementation costs several times over including the simulation experts for the first year.

At "drinctec" in Munich - the worlds most important exhibition for the beverage industry - KHS introduced their area of logistic expertise for the first time. The main part of this was the utilization of Enterprise Dynamics. The feed-back demonstrated that KHS made the right decision to purchase Enterprise Dynamics software.

3.6 Kuehne & Nagel projects

Recently INCONTROL performed a number of projects for Kuehne + Nagel. They perform projects in the supply chain market. 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 two different projects of Kuehne + Nagel in the food retailing market. The first project concerned the automation of a washing facility for crates. The second project concerned the automation of an order-fulfillment system of customer pallets with the use of "Automated Layer Picking". Both projects are discussed below.

Crate Washing Facility: Introduction
This project of Kuehne + Nagel concerns the automation of a washing facility for crates. These crates are used in the food retailing market (e.g. supermarkets) mainly for the transport of fruit & vegetables. For the washing of these crates a machine ("washing street") is used. The crates (6 different types) are internally transported in stacks and on different containers (e.g. rolly, pallet). Several material handling processes (e.g. stacking, palletizing) and transport processes (e.g. robots, conveyors) are needed to support these different types of transport batches. The capacity of the several material handling processes and washing process is dependent on the type of crate that is handled. Since the arrival and delivery intensity varies per moment of the day and per weekday, working buffers are needed to manage the workload on the washing process. Besides the physical aspects about internal transport and material handling also the work buffer management is taken into account in the project performed by INCONTROL.

Purpose and content
For INCONTROL, the purpose of the project was to deliver a user-friendly simulation model. The simulation model contains all relevant settings which enable the user at Kuehne + Nagel to analyze and evaluate all relevant considerations of the system design. The available settings concerned the following issues:

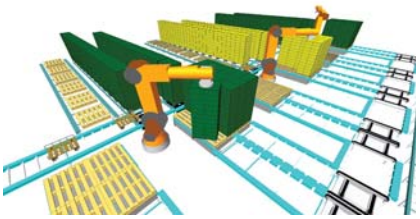
- Intensity and content of inbound and outbound flows
- Throughput capacity of the several processes (e.g. crates per hour)
- Use of capacity (e.g. one or two washers, amount of robots)
- Workflow management (e.g. allocation of crates to conveyors)
- Buffer management (e.g. minimal and desired buffer levels that triggered a washing algorithm with corresponding type and batch size)

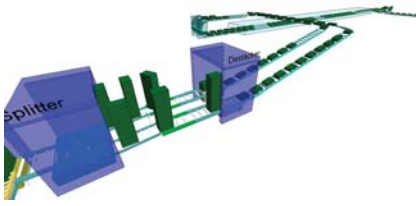
In order to do a proper analysis of the scenario, the following output parameters were exported to Excel:

- Scenario settings
- Buffer levels
- Decision log (e.g. system state with corresponding triggers)
- Utilization of processes
- Input and output statistic of the system and individual processes (e.g. robots, conveyors)

For commercial and communicational purposes the model was constructed in a 2D and 3D visualization and was based on a CAD drawing.

The use of a simulation model for the washing facility created the following benefits for Kuehne + Nagel. They were able to define the appropriate capacity that was needed. So validated decisions could be made concerning capital intensive resources, for instance, the amount of robots, conveyors and washing machines. Also Kuehne + Nagel was able to analyze the effect of different growth scenarios which prepared them for future changes in the market. From the initial project that was performed by INCONTROL it was concluded that the designed "washing batch algorithm" did not cope with all possible states of the system. Therefore an iteration was made in this algorithm in order to optimize it. If this optimization had to be done in a later stage of the design or even production, the financial consequences would have been much bigger.





Automated Layer Picking Project - Introduction
The second 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.

Unlike the first project, in which also an algorithm for order management was tested, 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 contents
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:

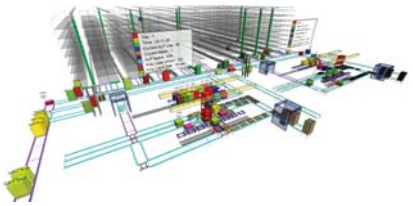
- Inbound and outbound flow of full product pallets
- Physical properties of the material handling entities (e.g. conveyor speed, handling speed of ALP)
- Use of capacity (e.g. amount of daughter pallet locations, use of pre-sorter, number of ASRS aisles)
- Input of order lines

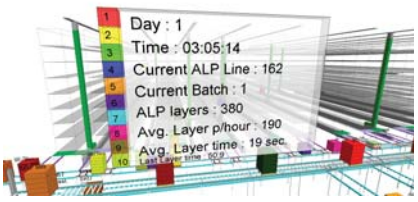
A feature that is used in this simulation model is the 3D visualization of output monitors that show the key performance indicators. In this way the user can also analyze the system performance in a 3D view. In order to do a detailed analysis of the scenario, the following output parameters were exported 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/buffer management of the systems. Since both systems are not built yet, these decisions can be made early in the design process of the systems. This way validated initial investment decisions about capital resources and order management systems to be made. INCONTROL hopes to continue the support and collaboration with Kuehne + Nagel in future projects.





4. ED Logistics - Simulation library

Atom	Small Description
Basic Modeling	
Product	General product atom
Source	Atom to generate other atoms / Entry point
Queue	Waiting area for atoms
Server	Machine which handles single atoms
Sink	Exit point for atoms
Node	Connector for atoms
Container	Pallet / Drum
Conveyor Atoms	
General Conveyor Functions	General functions for conveyors
Accumulating Conveyor	Accumulating conveyer
Fast Accumulating Conveyor	An accumulating conveyor
Advanced Accumulating Conveyor Straight	Sophisticated accumulating conveyer
Speed Changing Accumulating Conveyor	Conveyor capable of speed changes
Left Curved Accumulating Conveyor	Left Curved Accumulating Conveyor
Right Curved Accumulating Conveyor	Right Curved Accumulating Conveyor
Advanced Accumulating Conveyor Curved	Sophisticated curved conveyor
Non Accumulating Conveyor	Non-accumulating conveyor
Fast Non Accumulating Conveyor	A non-accumulating conveyer
Advanced Non Accumulating Conveyor Straight	Sophisiticated non-accumulating conveyor
Buffer Conveyor	Belt conveyor with buffer options
Left Curved Non Accumulating Conveyor	Left Curved Non Accumulating Conveyor
Right Curved Non Accumulating Conveyor	Right Curved Non Accumulating Conveyor
Advanced Non Accumulating Conveyor Curved	Sophisiticated curved conveyor
Intersections Atoms	
Corner Transfer Unit	Guides a product around a corner
Corner Transfer Lifter	Guides a product up or down
TurnTable Unit	Rotates product
Floorbound Atoms	
Transporter	Transporter / Truck
Advanced Transporter	Sophisticated transporter
Battery Charging Station	Battery charging station to be used with the Advanced transporter
Dispatcher	Sends an advanced transporter to designated locations
Destinator	Destination point for an advanced transporter when the transporter has multiple destinations
Speedometer	Supportive atom to display the speed of an advanced transporter
RFID-Gate	RFID gate

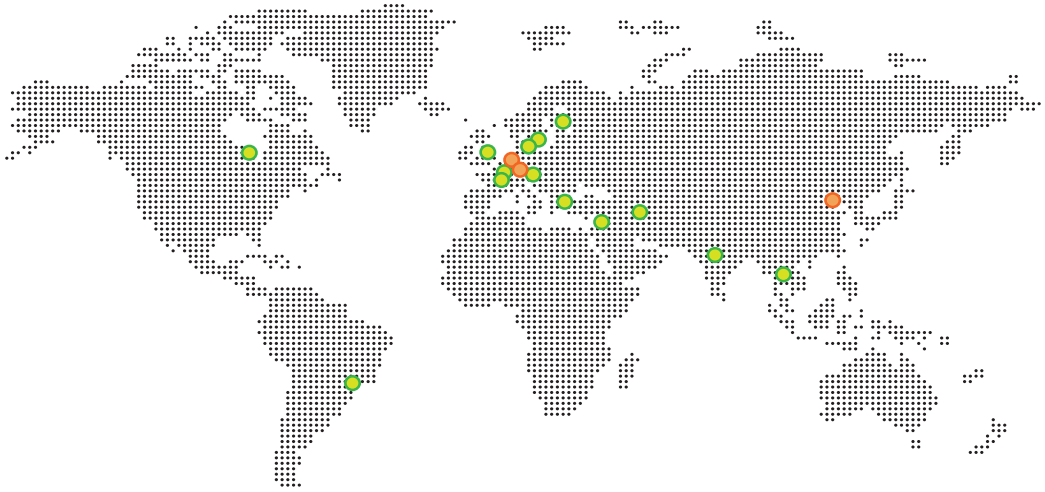
Atom	Small Description
Railbound Atoms	
Transfer Car	Simple car that moves between points
Elevation Atoms	
Elevator	Elevator to transport products between various elevations
Robot Atoms	
Robot	Simple robot
Advanced Scara Robot	Scara robot system
Advanced Linear Robot	Linear robot system
Advanced Vertical Articulated Robot	Sophisticated robot system
Crane Atoms	
Portal Crane	Single portal crane
Network Atoms	
Network Node	A node in a network. Networks are used to control movements of operators and transporters
Node Manipulator	Supportive atom to manipulate the nodes in a network
Network Controller	The controller for a series of nodes
Process Atoms	
Fast Server	Simple server
MultiService	Machine capable of handling multiple atoms at the same time
Carousel Server	Server that acts as a carousel with multiple process positions
Assembler	Machine that joins 2 atoms into 1
Splitter	Machine that slits 1 atom into multiple
Unpack	Machine that separate atoms
Assembler with Inventory	Same as the assembler atom with an additional inventory
Stacker	Stacks products on top of each other
SingleTransform	Machine which transforms an atom
MultiTransform	Machine which is capable of multiple transformations to an atom

Atom	Small Description
Storage Atoms	
Advanced ASRS	Atom to simulate an ASRS
Fast Queue FIFO	Simple FIFO queue
Kanban Bin	Used to model pull systems
Reservoir	A container for fluids
Warehouse	Multi-level storage container
Ground Storage	A ground area that behaves like a buffer to store products
Operator Atoms	
Team	Atom that sets the team membership of an Operator
Operator	Operator
Call Operators	Atom that sets a request for an operator
Free Operators	Atom to release an operator
Network Atoms	
Network Node	A node within a network
Node Manipulator	Supportive atom to design networks
Network Controller	Atom to control and optimize the network
Availability Atoms	
Availability Control	Atom that controls the availability of other atoms
Mtbf Mttr Availability	Time schedule for Mtbf Mttr
Switch Availability	On/off switch
Time Schedule Availability	Time schedule for availability
Flow Control Atoms	
Condition Control	Controls the flow by checking conditions of atoms
Notify Router	Used when multipl Condition Controls are used in a model
Lock	Controls the amount of atoms in a part of a model
Unlock	Controls the amount of atoms in a part of a model
Time Atoms	
ShowDateTime	Displays date time
User Events	Definition for specific user events
ArrivalList	A time schedule for the arrival of atoms / Entry point

Atom	Small Description
Data Atoms	
Table	An atom that defines a table
Export Table	Atom to export a table to file
Word	Atom to export data to Word
Excel	Atom to communicate with Excel
ExcelTableRead	Atom to read from Excel to a table
ExcelTableWrite	Atom to write a table to Excel
Database Connection	Connector to a ODBC database
Socket Listen	Atom to listen to TCP/IP messages
Socket Send	Atom to send TCP/IP messages
ExcelActiveX	Atom to communicate with Excel
Tools Atoms	
Composition Container	Container for atoms / Sub-models
Empirical Distribution	Assists in defining a new distribution
Function Editor	Allows you to add custom functions to a model
Initialize	Contains initialization code of the model
Status Atoms	
StatusIndicator	Display the status in a model
StatusMonitor	Display the status in a model
StatusHistogram	Display the status in a model
StatusMonitorStackedBar	Display the status in a model
Gantt Atoms	
Gantt Initialize	Initializes a storage point for the Gantt Chart
Gantt Chart	Displays a Gantt Chart
Results Atoms	
CircleDiagram	Circle Diagram
Histogram	Histogram
Scatterplot	Scatterplot
Data Recorder	Container for data that you want to store during simulation run
Graph	Graph
History Viewer	Allows you to view the history after a simulation run
Model Documentation	Generates model documentation
Monitor	Displays the value of a value in time
Report	Generates a simulation run report

Atom	Small Description
Visualization Atoms	
Animation Recorder	Records the camera positions during a simulation run
Bitmap	Displays a bitmap
Camera	Adds a camera in 3D
Color Glasses	Atom to display the 3D animation with anaglyphs
Omni Light	Adds an omni light
Textbox	Displays text
Movie Director	Records a movie
Virtual Reality Atoms	
VR Box	Displays a box
VR Cylinder	Displays a cylinder
VR Flexbox	Displays a box
VR Plane	Displays a plane
VR Sphere	Displays a sphere
VR Wall	Displays a wall
VR Building	Displays a building
System atoms	
Atom Versions	-
3DIcons	-
AtomLabels	-
AutoFit Support	-
Basic Icon Library	-
EditFields	-
Goods Icon Library	-
Graphs	-
History	-
Statuslist	-
Experiment Support	-
Search	-
Gui	-
Attribute	-
MoveAtom3D	-

Contact



The Netherlands

Papendorpseweg 77
3528 BJ Utrecht

T: +31 (0) 30 670 4015
F: +31 (0) 30 670 5634
E: SimInfo@IncontrolSim.com
W: www.IncontrolSim.com

Germany

Gustav-Stresemann-Ring 1
65189 Wiesbaden

T: +49 (0) 611 977 74 345
F: +49 (0) 611 977 74 171
E: SimInfo.Germany@IncontrolSim.com
W: www.IncontrolSim.com

China

A401, Building 3, Zhongli Technology Park, ST3
Shangdi Information Industry Base,
Hai Dian
DIST, Beijing, 100085

T: +86 (0) 10 62 96 4229

E: SimInfo.China@IncontrolSim.com
W: www.EnterpriseDynamic.com

For a complete list of partner addresses see: www.IncontrolSim.com