DIGITAL BROCHURE
INCONTROL AIRPORT SIMULATION SOLUTIONS

COMPANY INCONTROL SIMULATION SOLUTIONS
PRODUCT PEDESTRIAN DYNAMICS® AND ENTERPRISE DYNAMICS®
SIMULATION SOLUTIONS AIRPORT GENERAL
SIMULATION SOLUTIONS AIRPORT CROWD SIMULATION
SIMULATION SOLUTIONS MATERIAL HANDLING
SHOWCASE BRISBANE AIRPORT
SHOWCASE AMSTERDAM AIRPORT SCHIPHOL

INCONTROL
Simulation Solutions

INCONTROL
Simulation Solutions

COMPANY PROFILE

It is our mission to make clients and partners successful by offering the most innovative simulation solutions.

FACTS AND FIGURES

- Offices in The Netherlands (HQ), Germany, United States of America, Japan and China.
- Offers a worldwide partner network in more than 20 countries.
- 25 years of experience in developing simulation software.
- Successfully implemented more than 5.000 solutions worldwide.

INCONTROL SIMULATION SOLUTIONS

INCONTROL Simulation Solutions is the leading manufacturer of simulation software with over 20 years of experience. Our product portfolio contains Enterprise Dynamics®, Pedestrian Dynamics®, ShowFlow® and EDX®. Each product is developed for a specific market and tailored to the users. Key markets include:

- Logistics
- Manufacturing
- Airports
- Harbors
- Rail & Public Transport
- Crowd Safety & Infrastructure

MISSION

Our mission is to make our clients and partners successful in their field of application by offering the most innovative simulation solutions. Clients use our simulation software to simulate large scale logistic systems and infrastructures such as baggage handling systems, container terminals, train stations, assembly lines and football stadiums. Our simulation software enables the user to cope with time, costs, resources, reliability, safety and sustainability.

Solutions are implemented at leading companies worldwide. Our intensive educational efforts have led to a successful use of our simulation software at universities, schools and institutes all over the world.

Our offices are located in The Netherlands, Germany, the United States of America and China. Via these offices and a worldwide partner network we provide software, implementation, product training and a 24hr support to our products.

SOFTWARE

INCONTROL is the owner of various simulation software packages. This software is implemented and distributed by our own offices and our worldwide partner network. Each package has a strong simulation platform with an open architecture. The platform is used in combination with a library of user-friendly objects.

The software can be offered to the clients as:

- Platform; the client uses the platform to develop their own simulation applications and to develop their own library of objects.
- Platform and library of objects; the client uses the existing library of objects to develop a simulation model of their business operations.
- End user application; the client receives a simulation application, which is developed for the business operations of the client.

In consultation with the client it is determined which possibility complies to the client's needs for a successful implementation of our simulation software.

SERVICES

Implementation

If the client chooses an end-user application, INCONTROL works together with the client to implement the software. During this project an application is developed based on the client's wishes. INCONTROL has a department consisting of experienced simulation engineers. They will lead the project to a successful implementation.

Training

INCONTROL offers training for all users of our simulation software; starters as well as advanced users. This training can be followed at one of our training centers, located at our offices, or on-site at the customer. In addition to the standard training INCONTROL also offers customized training courses.

Maintenance & Support

As after sales service INCONTROL offers maintenance & support on the software. This includes full technical support, user support and product updates.

To evaluate how our simulation software can make you and your organization successful, please contact us or visit our website.

INCONTROL
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PEDESTRIAN DYNAMICS®

Pedestrian Dynamics® crowd simulation software is the ultimate tool to model, analyse, optimize and visualize pedestrian crowds in any infrastructure.

INTRODUCTION

APPLICATION AREAS
Pedestrian Dynamics® is applicable in a wide scale of domains:

- Stadiums & Arenas
- Museums & Exhibitions
- Events
- Theme Parks
- Shopping Malls
- Cities
- Airports
- Railway Stations
- Passenger ships

Pedestrian Dynamics® is an extensive and user friendly crowd simulation software application. It is designed for the creation and execution of large crowd simulation models in complex infrastructures. It can be used to evaluate the performance and safety of your environment in every phase of the life cycle; from design to operations.

Contact us for more detailed information or a demonstration of Pedestrian Dynamics®.

- www.pedestrian-dynamics.com
- www.twitter.com/pedestriandynam
- siminfo@incontrolsim.com

Pedestrian Dynamics®:

- Offers a rapid model building environment which saves time and costs. Only a few steps are required to model most complex operations.
- Is flexible, robust and easy to use.
- Has been used widely used in many large scale projects in most critical infrastructure environments including stadiums, airports, public transport terminals, mega events and urban planning.

Pedestrian Dynamics®
Crowd Simulation Software

With Pedestrian Dynamics® you can easily simulate large crowds and determine the density within the infrastructure.

BENEFITS

Pedestrian Dynamics® crowd simulation software has a proven track record to analyze and optimze large crowd flows. Crowd simulation enables you to:

Decrease costs: by optimizing the infrastructure during the design phase, high additional costs can be avoided during the operations.

Regulation compliance: help evaluate and address regulatory compliance with local and international safety mandates and norms.

Predict & anticipate: the model enables you to predict the crowd flows and anticipate.

Analyze the risk: analyze the risk and the safety of people and infrastructures in every phase of the life−cycle; from design to operation.

Optimize Evacuation: Develop, test and optimize evacuation and data−driven response plans.

Answer "What If": Quickly compare alternative designs and scenarios on−the−fly.

Improve commerce: Increase customer satisfaction by improving pedestrian flows, experiences and comfort and identify the commercial attractiveness of locations by flow measurements.

Present & convince: Effectively communicate with all stakeholders in the decision making process.

Operate efficiently: Optimize and increase operational efficiency within the given environment and with available resources.

KEY FEATURES

Pedestrian Dynamics® offers:

- Import of industry standards (CAD/CAD 2015, XML, CityGML and many more)
- Integrated 2D&3D models
- Fast simulation runs
- Simulation of large realistic crowds up to 100,000
- Explicit Corridor Mapping (ECM)
- Extensive set of model drawing tools
- Unique agent properties
- Domain specific elements
- Easy scenario definition
- Intelligent dynamic routing
- Microscopic and mesoscopic
- Integrated output module with automatic report generation.
- Easy movie playback and recording

ENTERPRISE DYNAMICS®

Enterprise Dynamics® is a leading simulation software platform for business modeling; quick and easy.

APPLICATION AREA'S

Enterprise Dynamics® is used by top 500 companies in:

- Manufacturing & Production
- Warehousing & Distribution
- Material Handling
- Supply Chain
- Rail

INTRODUCTION

Enterprise Dynamics® is a comprehensive enterprise simulation software platform that offers a fully configurable, scalable and easy−to−use simulation environment. Enterprise Dynamics® is a state−of−the− art modular object oriented simulation platform to help solve any complex people, process, technology and infrastructure related challenges with data−driven answers for most commercial, governmental, education and industrial applications. The Enterprise Dynamics® simulation model enables you to fully analyze, visualize and optimize the performance of your assets and investments. Enterprise Dynamics® can be utilized throughout the entire lifecycle of your investment, from design−build to operation and continuous improvements. Enterprise Dynamics® enables you to cope with resources, costs, time, reliability, safety and sustainability.

Enterprise Dynamics® offers a wide range of comprehensive, branch−specific simulation object libraries. The flexible and perfectly matched simulation objects provide the user the ability to represent both simple and highly complex processes and systems. If required, the objects can be created and ⁄ or modified individually to fit specific needs. Enterprise Dynamics® can be integrated with external data source and third party systems, if needed. Enterprise Dynamics® is a proven simulation software and been widely used around the world. There is virtually no limitation within the software platform.

So why speculate your situation, simulate and get answers with Enterprise Dynamics®.

With Enterprise Dynamics® you can analyze and optimize the current and future behavior of your system or infrastructure. Don't speculate... Simulate!

BENEFITS

The main benefits of simulation with Enterprise Dynamics® are:

- Virtual optimization: you can virtually test and improve any scenario throughout the entire system lifecycle without disrupting the actual system and also decrease the implementation period.
- Manage complexity & variation: large scale systems are difficult to manage. Enterprise Dynamics® offers you the perfect tool to create insight in your system.
- Improve communication: state–of–the–art 2D and 3D visualization enables you to communicate effectively and supports you in convincing stakeholders.
- Planning & preparation: with simulation you can answer all your "what–if" questions and optimize you resource planning.
- Return on investment: simulation software enables you to evaluate your potential and / or future resource investments.

KEY FEATURES

Enterprise Dynamics® offers:

- A powerful simulation platform for large–scale systems.
- Easy "drag & drop" model building.
- Extended object libraries and additional packages for different application areas.
- Extended set of pre–defined and user–defined control rules.
- Create your own object library and modify existing objects.
- State–of–the–art 2D & 3D visualization.
- Easy to use graphical user interface.
- Import your own 3D models.
- Extended result reporting module and standard output.
- Experiment wizard for fast and easy experiment design and reliable results.
- Open architecture; input and output connection based on all industry standards.
- No model limitations.
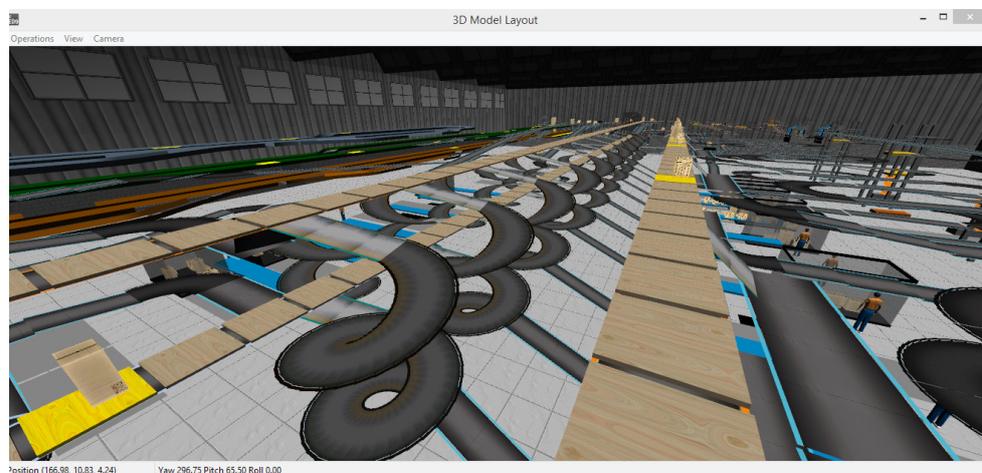
Enterprise Dynamics® has an easy to use graphical user interface and state–of–the–art 3D visualization.

AIRPORT

Be prepared for the future: analyze and plan your airport facilities on strategic, tactical and operational level.

AIRPORT SIMULATION

Our airport solutions offer simulation & capacity management solutions of choice for all ground service processes, such as:

- Landside (parking management, public transport)
- Airside (plane allocation, ground handling)
- Terminal (passengers, baggage handling)
- Cargo (warehousing, distribution, un−/loading)

AIRPORT MARKET
The airport solutions are based on the simulation tools Enterprise Dynamics® and Pedestrian Dynamics® and offer modules for passenger simulation, baggage simulation, gate capacity simulation and logistics simulation. The modules can be used separately or in combination.

Challenges of airports are for example traffic peaks and randomness related to:

- Passengers (arrival time, check−in mode, baggage factor, no shows)
- Baggage (handling times, equipment failure, operator availability, no read & lost bags)
- Aircrafts (flight schedules, punctuality, weather conditions, transfer ratio)

The airport solutions are successfully used by:

- Capacity Managers (short term and long term capacity versus flows)
- Logistics and System Engineers (process and control changes)
- Engineers, Architects, Airport Planners and Consultants (designing new infrastructure)
- Operational managers
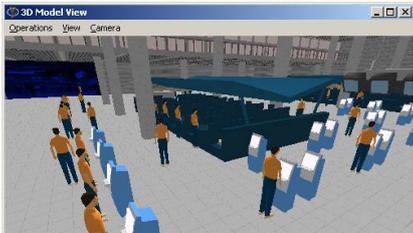
Visualization in 2D and 3D
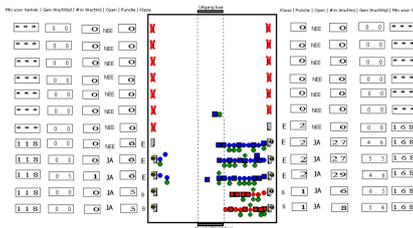
Check in strategy

Simulation model of baggage handling system

Pedestrian flow on an airport

BENEFITS OF SIMULATION

Simulation can help airports to answer extensive strategic, tactical and operational questions, such as:

Strategic questions
- Do I have sufficient capacity in the next 5 years?
- Is the design of new infrastructure valid?
- What happens if we shorten connection times in the schedules?

Tactical questions
- How can I improve my capacity utilization?
- How good are my planning rules?
- Is my back up procedure working properly?
- Sensitivity analysis for new flight schedules

Operational questions
- How many employees do I need between 10:00 – 12:00 in "Hall 2"?
- What can I do to bypass a partial system breakdown?
- How can I train my employees without disturbing my operation?

EXPERIENCE INCONTROL

INCONTROL has developed simulation models to assess the effects of alternative planning strategies of check–in counter capacity at Amsterdam Airport Schiphol. Using these models, INCONTROL advised the airport on a number of planning strategies that minimize waiting times and use the available check–in counter capacity in an efficient way.

INCONTROL modeled a current and future situation for the terminals and analyzed pedestrian flows of Brisbane Airport. The models give valuable insights in the passenger flows throughout the terminal buildings. They enable the user to analyze bottlenecks, identify potential improvements and to perform what–if analysis and thus support the decision making process on operational, tactical or strategic level.

The project experience and knowledge of the INCONTROL developers and engineers are used for the ongoing development of the software. Together with the network of INCONTROL, which will be used optimally at all times and made available for every customer, INCONTROL offers state–of–the–art simulation solutions.

AIRPORT CROWD SIMULATION

Facing great challenges at an airport terminal regarding crowd safety, capacity and commerce? Analyze crowd behavior with simulation software!

TECHNICAL KEY FEATURES

- Simulate up to 100,000 individuals
- Quick & easy modelling
- Applicable to every airport
- Analyze an area up to two square kilometre
- Realistic crowd movements with unique agent properties
- Amazing 3D visualization
- Detailed output results
- Import drawing & models based on industry standards

AIRPORT CROWD SIMULATION

At an airport everything should be perfectly tuned. Therefore, there is no infrastructure where insights into pedestrian flows, waiting times, process times, capacities and the mutual relation between these themes are more important than at an airport. Designers and architects face major challenges when developing the infrastructures of airport terminals. Departure terminals, lounges, corridors and gates should provide sufficient capacity and must be positioned logically. In addition, the infrastructure must meet all safety requirements.

During the operation an airport, it is important to use the current infrastructure in the most efficient way. With the arrival and departure of ten thousands of passengers every day taking several proceedings and procedures within a short time, this is a complex challenge. Based on the analysis of passenger numbers, process times and queuing times, efficiently duty–rosters for the airport staff can be made. However, due to deviations from flight schedules, there is no such thing as an ordinary day.

Using simulation software will repay itself by maximizing sales, increasing traveller satisfaction and creating commitment from unions and governments.

SIMULATION SOLUTIONS

Simulation software is the solution for the understanding of the effects of these dynamic environments. Simulating passengers flows in complex infrastructures is used to evaluate and improve the safety and performance of environments. Using simulation software during the design and operational phase of an airport offers the following benefits:

- Save time and money by evaluating and optimizing the safety and performance of the airport during the design phase;
- Gain insight into the complete infrastructure, passenger flows, waiting times, process times and potential bottlenecks;
- Support the development of evacuation and contingency plans;
- Use it for staff schedules based on expected crowdedness, pedestrian flows and process times;
- Present the infrastructure of the airport in a 2D and 3D visualization to your stakeholders;
- Determine commercial attractive areas on the airport, based on pedestrian flows.

SAFETY, CAPACITY AND COMMERCE ON AIRPORTS

Simulating pedestrian flows gained ground the last few years. The most important reason is that safety and security of visitors has become one of the main issues at airports. In addition it gives answers to complex issues related to capacity management and commerce on airports. Many different parties such as architects, authorities and emergency services are already using simulation software to support their mission. INCONTROL offers its own state–of the art crowd simulation platform Pedestrian Dynamics®.
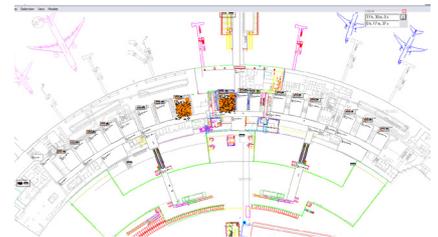
EXPERIENCE INCONTROL

The project experience and knowledge of the INCONTROL developers and engineers are used for the ongoing development of the software. Together with the expertise and network of INCONTROL, which will be used optimally at all times and made available for every customer, INCONTROL offers state–of–the–art simulation solutions. Examples of projects include; Simulation application for Amsterdam Schiphol Airport: How can Schiphol Airport optimize transferring passenger flows? Brisbane Airport: What is the best design for a the new terminal?

MATERIAL HANDLING

If there is one area where simulation is well applicable, it is automated material handling systems. Simulation has proven its value in this field numerous times.

KEY BENEFITS

- Test a future system in an early design stage.
- Test and improve proposed modifications without disturbing the operational environment.
- Modeling and analysis of several scenarios to be prepared for the future.
- Optimization and safeguarding of investment planning for production and transport equipment.
- Estimating the influence of uncertainties and variations.
- 2D and 3D visualization.

TRADEOFFS WITHIN THE MARKET

The underlying question within this market is often the estimation of the Return of Investment (ROI) for the automated handling systems. It generally concerns a tradeoff between preserving a manual operation and investing in automation of the handling. Other considerations may be the comparison between several options for automating the material handling.

The tradeoffs regard of course financial consequences – investment costs versus reduction of FTE's – but also logistical aspects, such as the required flexibility in routings, peak capacities, availability and reliability.

MATERIAL HANDLING SIMULATION

Simulation systems or applications for those goals are constructed with elements representing different types of conveyor systems, DCV systems, overhead cranes, sorters, robots, AGV's and many other ready to use modeling blocks. The characteristics and control rules are then customized to make them representative for the handling equipment in the actual or proposed situation.

The performance indicators measured in models of automated material handling systems include achievable throughputs, lead times over the various trajectories and the results of queuing effects in the system. Furthermore, an important result of models can be the determination of the degree of system redundancy.

Enterprise Dynamics® is applied for modeling automated handling systems in industrial environments, in distribution centers and in airport baggage systems. Besides, several manufacturers of automated material handling systems use the software as a service to prove the system functionality to their customers.

EXPERIENCE INCONTROL

The experience of projects within the different field of applications and knowledge of the INCONTROL developers and engineers are used for the ongoing development of the software. Together with the expertise and network of INCONTROL, Enterprise Dynamics® offers the flexibility for successful simulation projects in every market.

With decades of automated material handling systems experience and knowledge, Enterprise Dynamics® has proven to be the best solution for various important themes within this market.
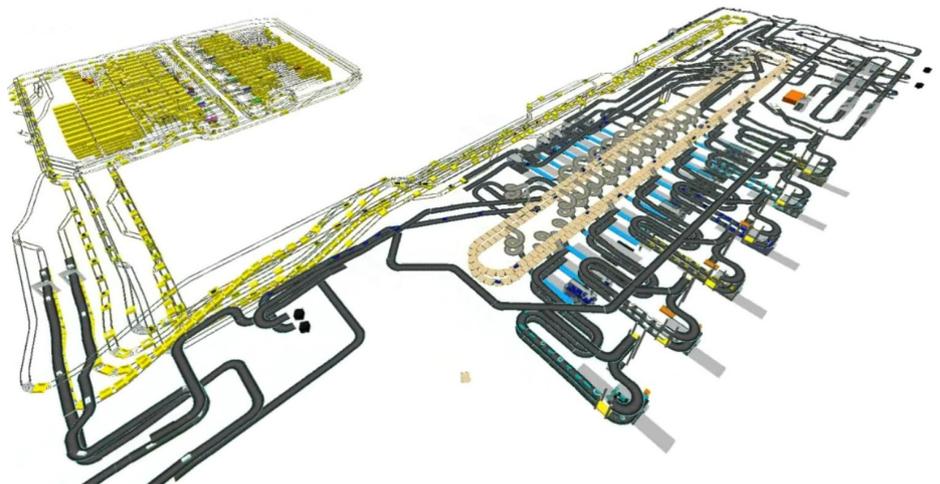
Model of baggage handling system at Amsterdam Schiphol Airport.

INCONTROL
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PASSENGER FLOW SIMULATION

Brisbane Airport

For the sixth year Brisbane Airport was ranked as the best Australian Airport. They chose INCONTROL's simulation software to keep this position!

INDUSTRY
Crowd Simulation & Infrastructures

APPLICATION AREA
Airport

COUNTRY
Australia

CHALLENGE
Improve and support the decision making process, in order to maintain the desired service level while capacity is increasing.

SOLUTION
INCONTROL modeled a current and future situation for the terminals and analyzed pedestrian flows.

KEY TO SUCCESS
With simulation software you can analyze bottlenecks, identify potential improvements and perform what–if analysis.

BRISBANE AIRPORT
Brisbane Airport, situated in South East Queensland is the third largest in Australia (on passenger numbers) and ranked 61 in the World. For the sixth year in a row Brisbane Airport was ranked by the ACCC as the best Australian Airport for overall quality of service, standard and availability of facilities. The airport consists of two terminals, domestic and international, two runways and is operational 24 hours a day 7 days a week. In the year 2009 the international terminal served approximately 4 million international passengers and 14.5 million domestic passengers. By 2015 the international terminal is predicted to host more than six million passengers.

EXPANSION TERMINALS
Major project works were planned for both the domestic and international terminal to be able to host the growing number of passengers. Recently the international terminal has been extended with more capacity at all levels. Capacity increased in the check–in areas as well as in security, customs and reclaim areas. Also at the domestic terminal plans are ready for big renovation works and extension of the terminal and car park facilities.

ANALYZE BOTTLENECKS, IDENTIFY IMPROVEMENTS AND PERFORM WHAT–IF ANALYSIS

In order to improve and support the decision making process, Brisbane Airport decided to buy INCONTROL's solution for simulation of airport processes. Brisbane Airport was looking for a terminal modeling tool and models for both terminals. INCONTROL developed several models for Brisbane Airport. For both terminal buildings the current and a future situation have been modeled. The models give valuable insights in the passenger flows throughout the terminal buildings. They enable the user to analyze bottlenecks, identify potential improvements and to perform what–if analysis and thus support the decision making process on operational, tactical or strategic level.

USER TRAINING

Once the models were finished, operation managers at Brisbane Airport have been trained to use the simulation models for further analysis and experiments. The user can edit operational parameters like process times and capacity planning to represent actual or future airport operations. An input module is provided where the flight schedule can be loaded. The input module generates passenger numbers based on aircraft utilization and transfer rates.

OUTPUT

Besides visual insights when running the models, the solution includes an output module which exports the results to Excel. The output module shows results of resource utilization, throughput times and queue lengths per process and per area. It also shows the dwelling time of passengers in the commercial areas.

INCONTROL
Simulation Solutions

BAGGAGE HANDLING SIMULATION FOR OVERALL CAPACITY PLANNING

Schiphol
Amsterdam Airport

Simulation has become part of the baggage operation at Amsterdam Airport Schiphol "No structural modifications are done without using simulation".

INDUSTRY
Airport

APPLICATION AREA
Baggage handling

COUNTRY
The Netherlands

CHALLENGE
Provide insight in the capacity of the baggage handling system under all circumstances.

RESULT
Investigate system capacity constraints / efficiency during maintenance or (re−) construction operations.
Create support for (future) business cases and investments.

KEY TO SUCCESS
Baggage handling is executed by a very complex system in which investigations cannot be performed within the live operation. A simulation model creates an environment in which numerous efficiency measures can be executed without any risk.

AMSTERDAM AIRPORT SCHIPHOL
Amsterdam Airport Schiphol is one of the largest European airport hubs. Currently, it handles over 55 million passengers annually of which about 40 percent is transferring. Within the airport infrastructure the baggage handling system is an important part. The system transports, screens and sorts the bags of all passengers. The available time is limited: all bags have to be ready 10−15 minutes before flights are departing. For the next years, the airport foresees a further increase in traffic. To accommodate this traffic, and to deal with new, more strict, EU baggage screening regulation, the baggage handling system needs to be expanded. The goal is to handle 70 million bags per year around 2020.

BAGGAGE HANDLING SIMULATION
More than a decade ago, simulation projects for baggage handling at Schiphol were initiated to evaluate capacity requirements of a system part. A simulation model was developed for this specific part, and some simulation experiments were performed. After the results were reported, the project ended and the model was not used anymore.
A few years later, most of the baggage handling system was available as independent models. The capacity of the systems was reaching its limits due to a large increase in baggage flow. Simulation was used to find short term and long term solutions to increase and optimize the capacity and performance of the systems. Optimizing separate subsystems was not an option, because this could result in bottlenecks in other subsystems. Therefore, the existing models were all connected together. This overall model SIMBAX reflects the current situation of the baggage handling system in detail.

Simulation has proven to be successful. At Schiphol SIMBAX is being used to gain insight in the overall performance of the system and in the flows for the upcoming season. Further, to decrease in system times by reducing bottlenecks, to optimize the available capacity, to improve the redundancy of the system, and to validate future capacity requirements. This results in a better performing baggage handling system and allows the capacity managers at Schiphol to anticipate on future situations.

Simulation has also become a design supporting tool. When developing costly and complex systems it is important to validate and improve the design as soon as possible so management can be convinced that the system will meet the requirements. Simulation is also used to test new ideas and to assist in operational management. Simulation has become part of Baggage operation ''No structural modifications are done without using simulation''.

OUTPUT
The output is presented in Excel, making it easily accessible, using the same subdivision as in the model. So, the performance of the overall system and performance of the different sub–systems are presented in different sheets. Within ED bags can be individually approached, which allows to store information about individual bags. This is the bases for the output. Bags are logged when they pass a specified location. Using this information in combination with the bag properties (e.g. outbound / inbound flight number, routing destinations, etc.), most of the desired output can be extracted.

Examples are:
- Flows
- Transportation times on certain routes
- Transportation times on certain routes for specific groups
- Buffer occupancy
- Totals over the day
- Routes of single bags

Additional required output is logged separately. All data is stored in a database and is extracted in Excel by using SQL queries, keeping the excel sheets clean from excessive data. This flexible method gives detailed information about the system and also turned out to be extremely useful when addition output is required when investigating odd behavior without re–running the simulation.