

Warehouse Suite Demo Wizard

Simulation of Warehouses

Quick Guide

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Introduction

When to apply Simulation?

Simulation is applied when processes are:

- ▶ Complex
- ▶ Dynamic
- ▶ Uncertain / Stochastic

And gives decision support when:

- ▶ Real systems don't exist
- ▶ Real changes and testing has high impact
- ▶ Discussions start

Introduction

What are the advantages of Simulation?

In order to:

- Provide insights in processes & investments
- Improve utilization and capacity
- Improve customer satisfaction
- Reduce risks
- Save money

Introduction

What is the purpose of the Warehouse Wizard?

- ▶ Fast modeling of a warehouse layout
- ▶ Easy way to create a simple real life model
- ▶ No simulation experience necessary

Explanation of the Wizard

Overview(1)

The Warehouse Wizard consists of the following 5 pages:

- ▶ Welcome page
- ▶ Infrastructure
- ▶ Transporters
- ▶ Products
- ▶ Orders

Explanation of the Wizard

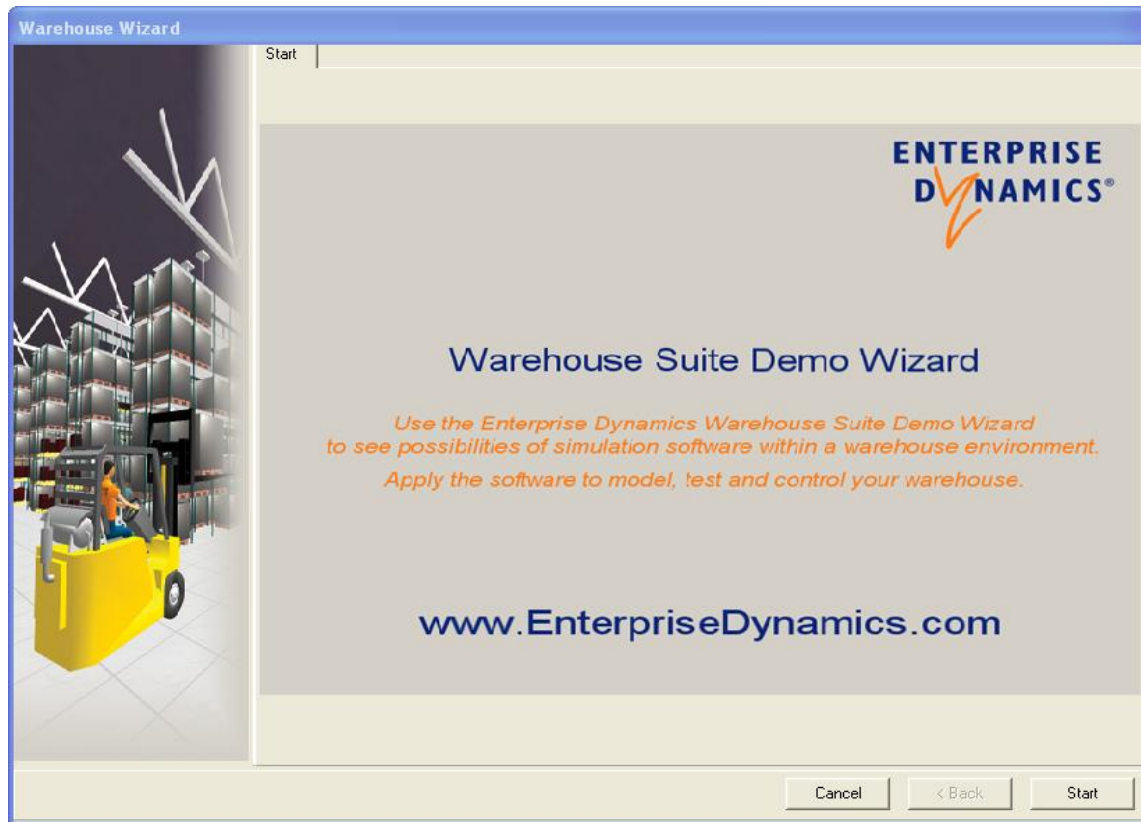
Overview(2)

In general:

- ▶ Every page contains default values
- ▶ This Demo version has limitations for user inputs
- ▶ These limitations will be displayed when the user moves the mouse cursor over an input field
- ▶ By pressing the Start / Next – Button the next Wizard page will be displayed
- ▶ By pressing the Back – Button the user can go backwards to previous pages and change values there again
- ▶ By pressing the Finish – Button on the last Wizard page the model will be created

Explanation of the Wizard

Welcome page



Press the Start Button to go to the next page

Explanation of the Wizard

Infrastructure(1)

Warehouse Wizard

Infrastructure

The infrastructure of your warehouse has to be implemented first:

Racks Define the size of your racks and how many locations for products are in one rack.



Length meters

Width meters

Height meters

Number of shelves

Number of columns

Aisles How many aisles (paths for your transporters) are in the warehouse? Which width for the aisles do you need?

Number of aisles

Width of aisle meters

Cancel < Back **Next >**

Explanation of the Wizard

Infrastructure(2)

The Layout of the warehouse is the first step.

In the upper part of this sheet the user defines the dimensions and subdivisions of the racks.

Each rack will be described by the following parameters:

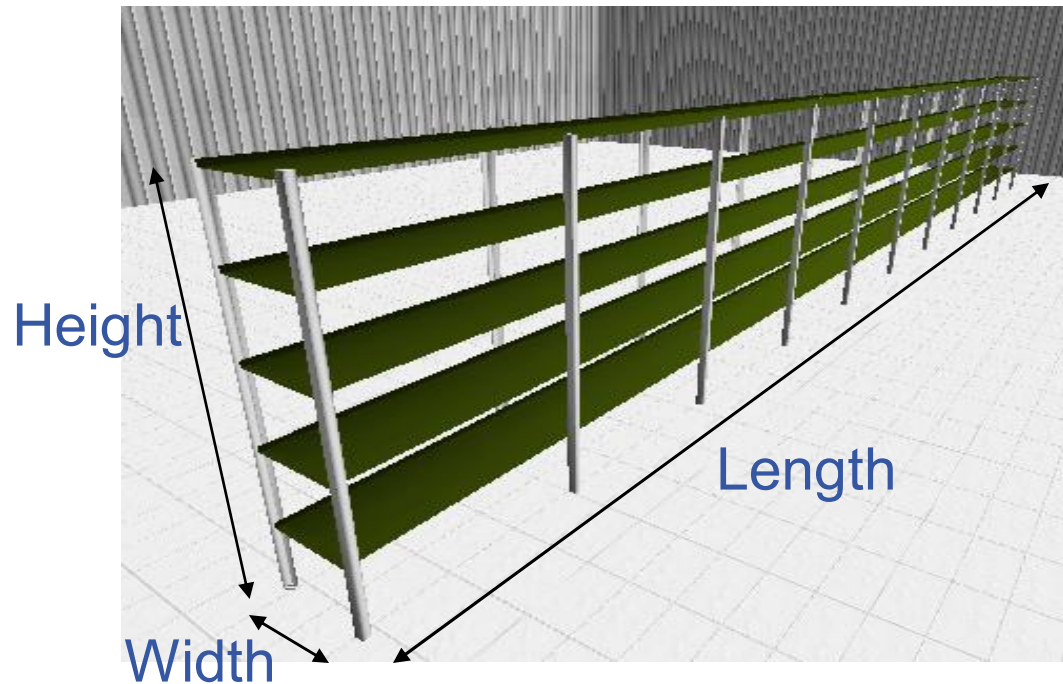
- ▶ Length (in meters)
- ▶ Width (in meters)
- ▶ Height (in meters)
- ▶ Number of shelves
- ▶ Number of columns

Explanation of the Wizard

Infrastructure(3)

Rack:

- ▶ Length
- ▶ Width
- ▶ Height

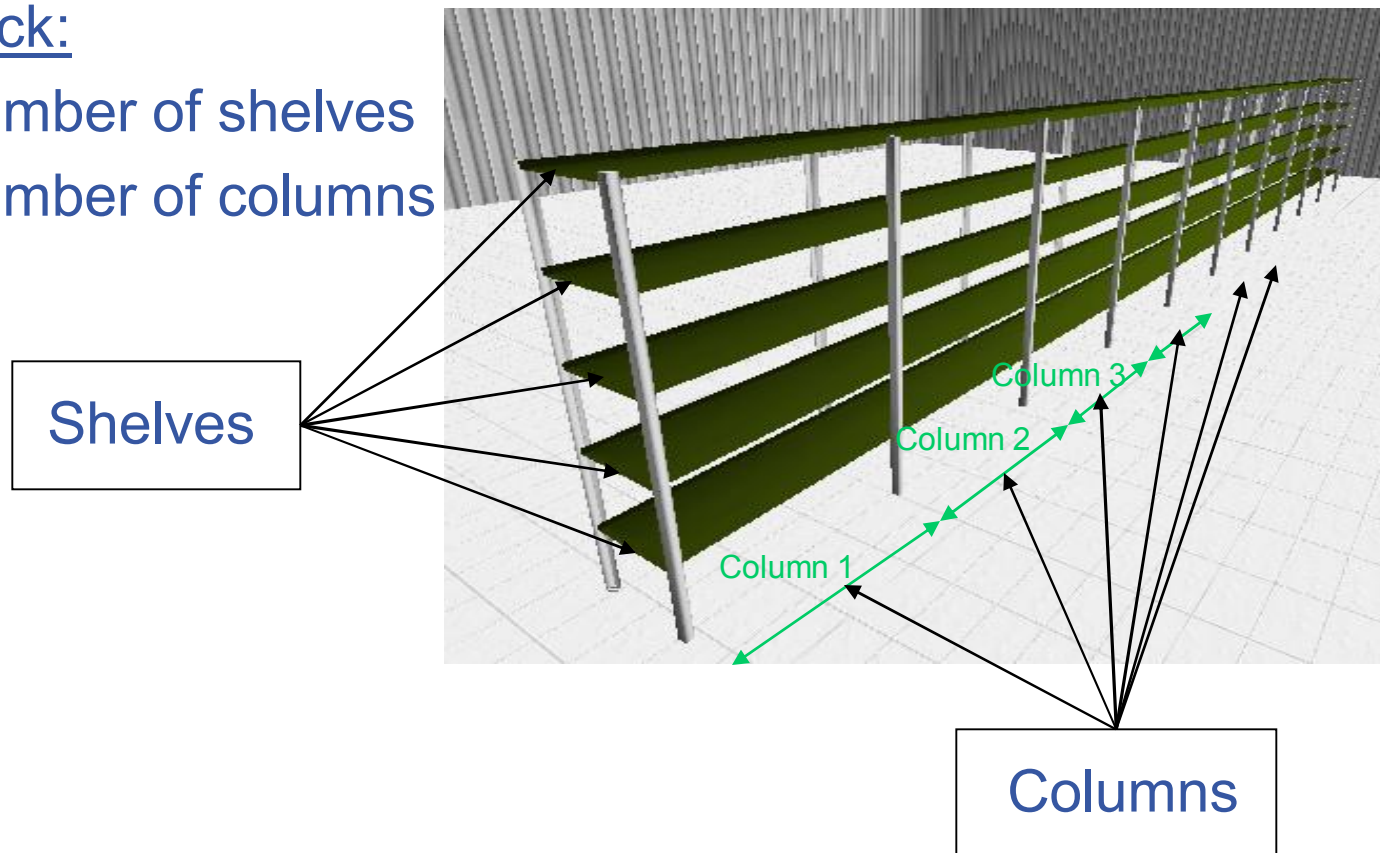


Explanation of the Wizard

Infrastructure(4)

Rack:

- ▶ Number of shelves
- ▶ Number of columns



Explanation of the Wizard

Infrastructure(5)

In the lower part of this sheet the user will define the number of racks and the aisles between the racks.

An aisle is a path where picking and placing will take place between two racks.

The aisles will be described by the following parameters:

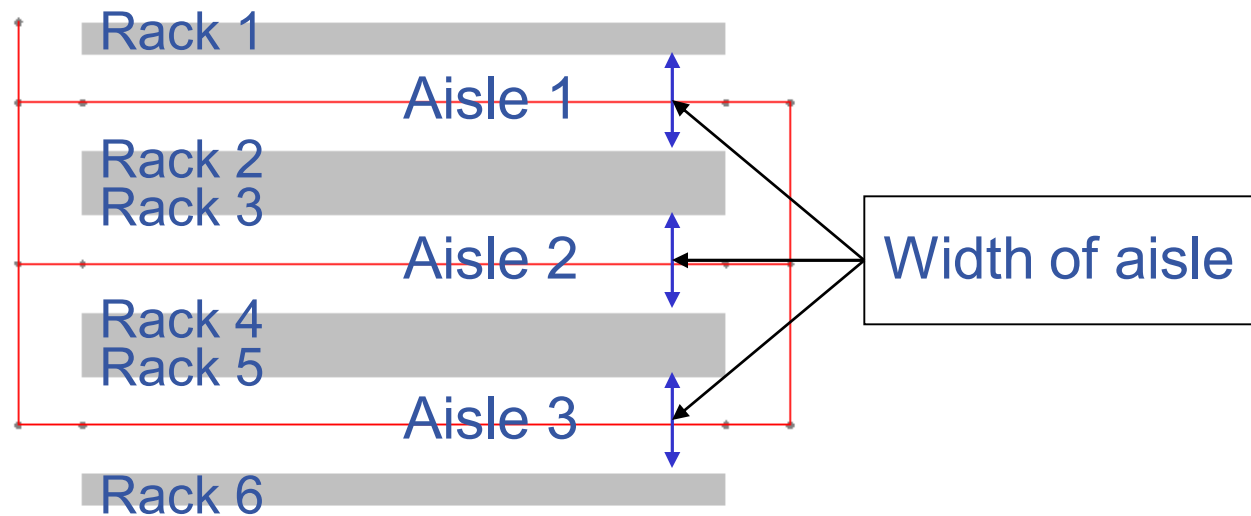
- ▶ Number of aisles
- ▶ Width of aisle (in meters)

Explanation of the Wizard

Infrastructure(6)

Aisles:

For example, if you choose Number of aisles: 3 with a certain Width of aisle, you will later, after finishing the Wizard, get a 2D top view Layout like below.



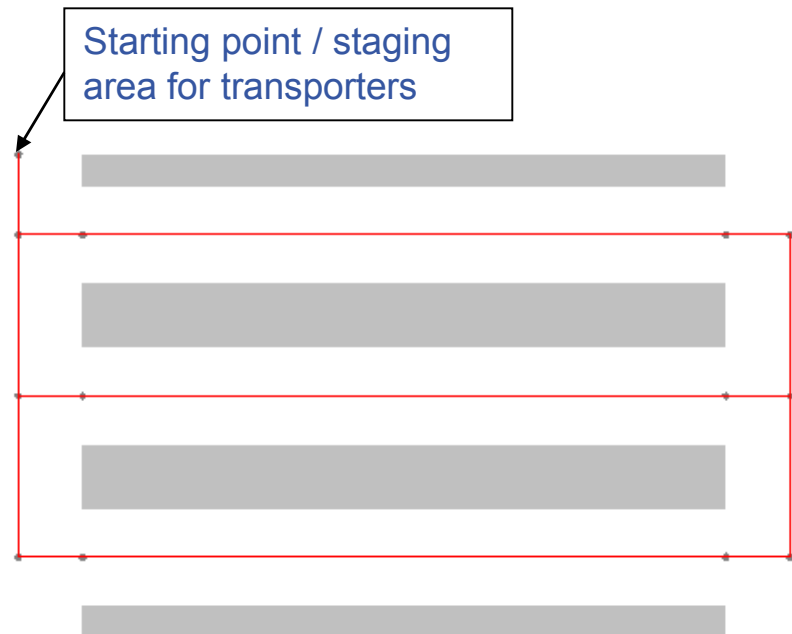
Explanation of the Wizard

Infrastructure(7)

Next to the Layout, the travel paths for picking and placing will be created (see **red** lines).

Travel paths system:

- ▶ Starting point for the transporters
- ▶ Travel paths in the middle of an aisle
- ▶ Moving around the racks




Explanation of the Wizard

Transporters(1)


Warehouse Wizard

Transporters


In this demo you can choose between three transporter types:



Forklift Truck



Transporter



Cart

Transporter specification

	Inbound transporter(s)	Outbound transporter(s)	Flexible transporter(s)	
Transporter type	Forklift Truck	Cart	Cart	Different transporters can be used for the inbound and outbound processes. The flexible transporters can work in both processes.
Speed	2 m/sec	0.5 m/sec	0.5 m/sec	
Load time	1.5 min	1 min	1 min	
Unload time	1 min	2.5 min	2.5 min	Speed, load and unload time are set to default values, you can change them in the model.
Number of transporters	3	8	5	The number of transporters is limited to 15 in this demo.
Number of products per transporter	1	5	5	The number of products per transporter may differ, here in the demo they are fixed to the transporter type.

Look at the working times and breaks of the transporters:

Work schedule

Explanation of the Wizard

Transporters(2)

The defining of the transporters is the second step.

There are transporter teams to define for the 3 different possibilities:

- ▶ Inbound transporters

Inbound means all transporting activities bringing and storing goods in the warehouse (racks)

- ▶ Outbound transporters

Outbound means all transporting activities taking goods out of the warehouse

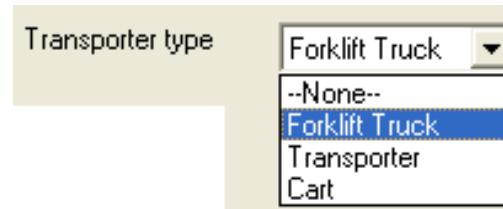
- ▶ Flexible transporters

These transporters can do both, inbound and outbound activities

Explanation of the Wizard

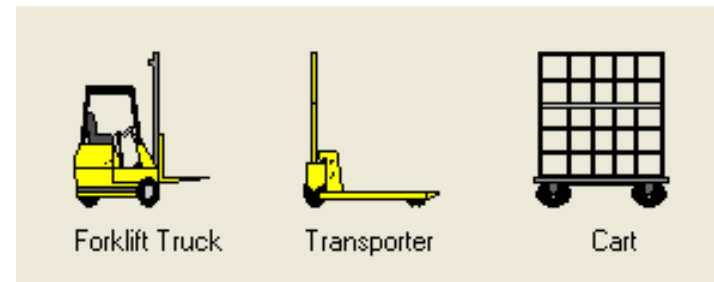
Transporters(3)

For each (Inbound, Outbound or Flexible) transporter a transporter type can be selected in the related Combo Box



At the moment there are 3 different transporter types available:

- ▶ Forklift Truck
- ▶ Transporter
- ▶ Cart



Explanation of the Wizard

Transporters(4)

Transporter types:

- ▶ Each transporter type has some specific parameters like Speed, Load Time and Unload time
- ▶ These parameters are predefined with (in this Demo-Version) not changeable values
- ▶ For each transporter type and each group like Inbound, Outbound or Flexible, the user can define the Number of transporters and the number of products a transporter can carry (Number of products per transporter)

Explanation of the Wizard

Transporters(5)

By pressing the Button Work schedule a window appears.
For all groups and types the following settings can be changed:

- ▶ Start and End time for working
- ▶ Start and End time for Break / Lunch

Work Schedule

Work schedule for transporters

Working time

	Inbound transporter(s)	Outbound transporter(s)	Flexible transporter(s)	
Start time	08:00	08:00	08:00	The working time for inbound and outbound transporters may differ, fill in new values by using the drop down list. The flexible transporters can have other working times as well.
End time	16:00	16:00	16:00	

Break time

	Inbound transporter(s)	Outbound transporter(s)	Flexible transporter(s)	
Start time	12:00	12:00	12:00	When are the break times for the transporters in your warehouse? Adjust them according to the inbound and outbound process.
End time	13:00	13:00	13:00	

Cancel OK

Explanation of the Wizard

Products(1)

Warehouse Wizard

Products

The products in your warehouse can be divided in product types. In this demo there is a maximum of 10 product types. It is however possible to have every single part number in the simulation model.

Product types

Number of product types:

	Inbound %	Outbound %
1	60	50
2	20	25
3	20	25

Choose the number of different product types that can be used to model your inbound and outbound processes in the warehouse.

Product type 1 is the fast mover in the warehouse. It will always be placed in the area nearest to the docks. In the model this area has been made visible with the color yellow.

60 % inbound of product type 1 tells you that 60 % of the inbound orders are caused by product type 1.

Explanation of the Wizard

Products(2)

The defining of the products is the third step.

Different types of products can be defined in that page.

For the Demo-Version there is a limitation of 10 different products.

The Number of product types can be changed in the Combo Box

According to the number the user has chosen the different product types can be seen in the table next to it.

Explanation of the Wizard

Products(3)

Product Table

- ▶ Number of different products
- ▶ Default percentage rate for each product type, that indicates how often a certain product type has to be dealt with for Inbound and Outbound transport.
- ▶ Percentage rates can be changed.
The user has to make sure that the sum of all percentages for Inbound or Outbound has to be 100 %.
- ▶ The Button Check Sum helps the user to calculate the sum of all values in the Inbound and Outbound column

	Inbound %	Outbound %
1	40	30
2	10	15
3	10	10
4	10	10
5	5	10
6	5	5
7	5	5
8	5	5
9	5	5
10	5	5

Check Sum

Explanation of the Wizard

Orders(1)

Warehouse Wizard

Orders

Define the number of inbound and outbound orders per day, the arrival time and the releasing method of the orders to finish the settings of your warehouse model.

Order control		Inbound		Outbound					
Start time	<input type="text" value="8"/>	hours	<input type="text" value="8"/>	hours	Adjust the start and end time of the arrival of inbound and outbound orders. This is independent of the work schedules of the transporters.				
End time	<input type="text" value="16"/>	hours	<input type="text" value="16"/>	hours					
Releasing time	<input type="text" value="60"/>	min	<input type="text" value="10"/>	min	For Example: Every 60 min an inbound order is released.				
Number of orders per day	Minimum	<input type="text" value="100"/>	Maximum	<input type="text" value="250"/>	Minimum	<input type="text" value="1000"/>	Maximum	<input type="text" value="2000"/>	Set the minimum and maximum number of inbound and outbound orders per day.
	Number of products per order	<input type="text" value="1"/>	<input type="text" value="1"/>	<input type="text" value="1"/>	<input type="text" value="10"/>	Implement the minimum and maximum number of products per order.			

Cancel < Back Finish

Explanation of the Wizard

Orders(2)

The defining of the orders is the last step.

- ▶ The first part defines the start and end time for Inbound and Outbound when orders come in and are accepted (These times are independent from the working times of the transporters).
- ▶ The releasing time defines the period of time in which orders are collected and freed. After this period of time the transporters work on this released bundle of orders.

Explanation of the Wizard

Picking / Placing Strategy(1)

Process:

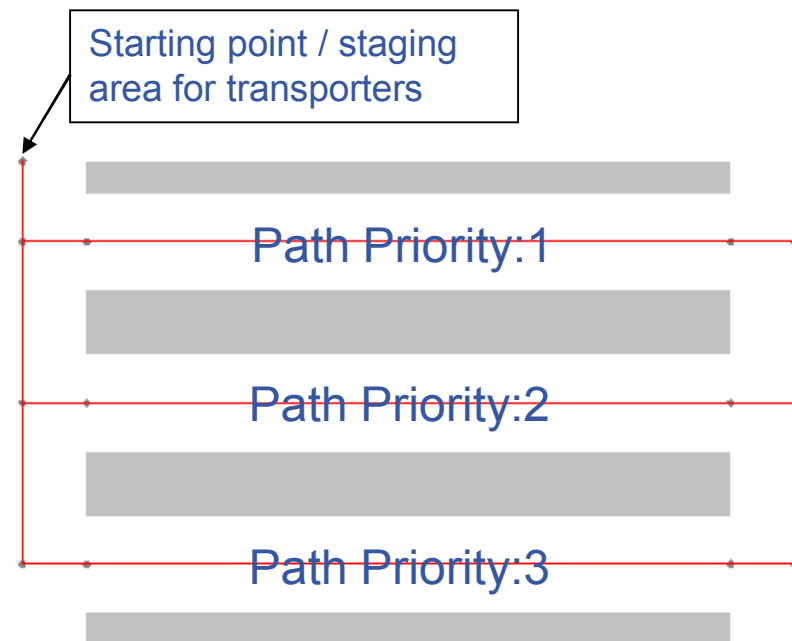
- ▶ Orders come in
- ▶ Orders are collected and put in bundles during the releasing time
- ▶ Bundles are collected according to aisle numbers
(if possible every order in a bundle should have the same aisle number)
- ▶ The bundles are given to workers (after releasing time has passed!)
- ▶ The workers start working on their bundle

Explanation of the Wizard

Picking / Placing Strategy(2)

Transport path priority

- ▶ The transport paths have their own priorities with increasing values by a growing distance to the Starting point (Path Priority 1 means highest Priority!)
- ▶ Workers start working on their bundle of orders beginning with the path with highest priority.



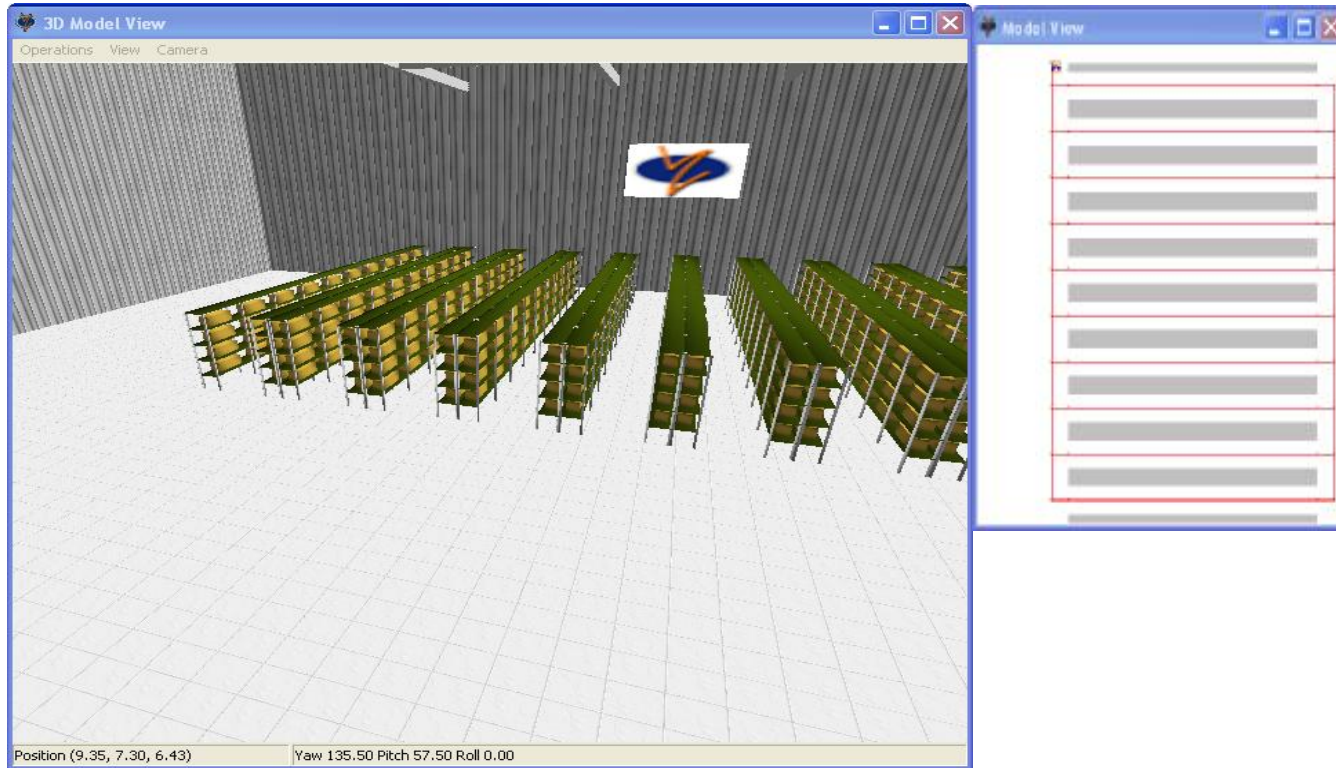
Results

After pressing the Button Finish the user gets the following results from the Warehouse Wizard:

- ▶ Layout of a warehouse in 2D and 3D
- ▶ Runnable simulation model
- ▶ Utilization Graph of the transporters

Results

Layout in 2D and 3D (1)



Results

Layout in 2D and 3D (2)

- ▶ 2D top view of warehouse with racks and transport paths
- ▶ 3D animation with surrounding warehouse building

Mouse Controls for 2D and 3D windows:

- ▶ Press and hold left Mouse Button lets you move around
- ▶ Press and hold left and right Mouse Button lets you zoom

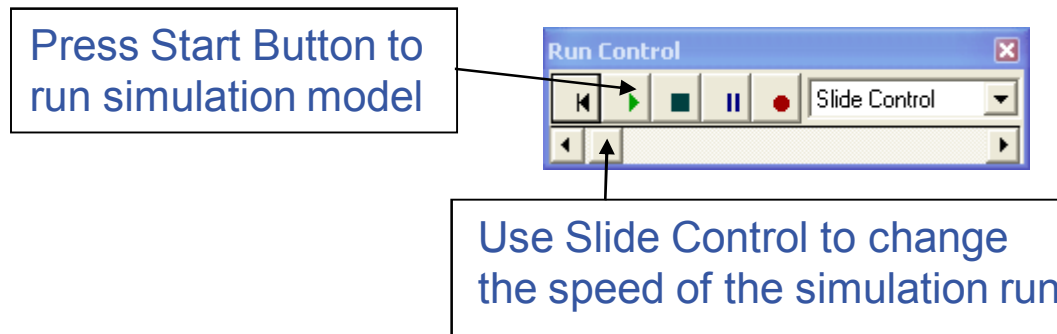
Mouse Control for 3D window only:

- ▶ Press and hold right Mouse Button lets you change the point of view

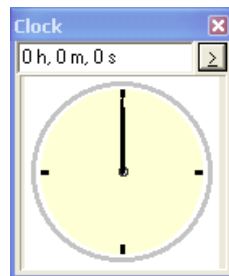
Results

Runnable simulation model

- ▶ By using the Run Control window you can start the simulation model



- ▶ The clock displays the actual time



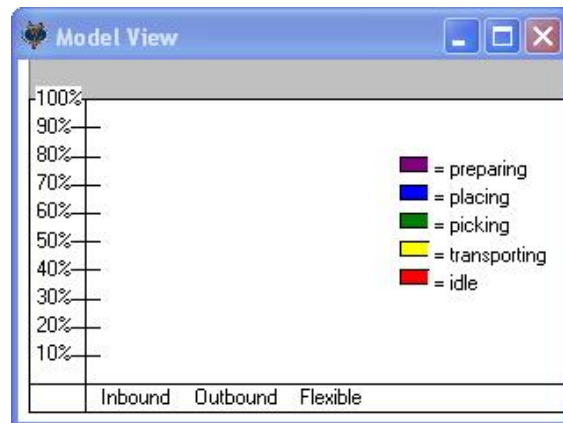
Remember:

The simulation starts at 00:00, but the first activity will take place when the workers start (e.g. 08:00 AM)

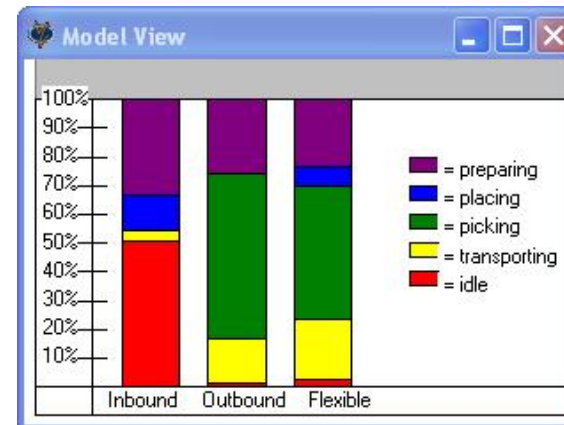
Results

Utilization Graph of the transporters

- ▶ With the utilization graph you can see the activities of your workers during the day



at start



during simulation run

Restart Warehouse Wizard

If you want to change or modify your settings you can start the Warehouse Wizard again.



Choose **Warehouse Wizard** in the menu Warehouse Suite to change your current settings. The Warehouse Wizard will pop-up again.