Tecnomatix Plant Simulation 15.0
Version Content Overview

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*Ingenuity for life*
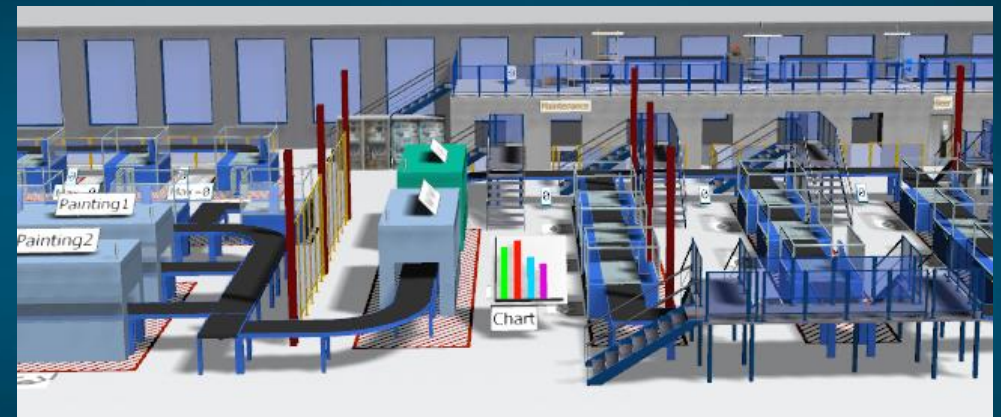
Version 15.0:
Major Topics and Enhancements

New Topics:
- Free AGV movement on floor space, independent from a track system
- Introduce Simulation Based Costing:
  evaluate investment costs and costs per piece
- Automatic part routing on conveyor systems and machines
- 3D kinematics definition and Pose Editor

Enhancements:
- New Gantt Chart tool
- Improved handling of parts loaded to a carrier systems
- Debugger Enhancement: conditional breakpoints
- Ease-of-use for interfacing with Teamcenter and Line Designer
- Support for subscription based licensing
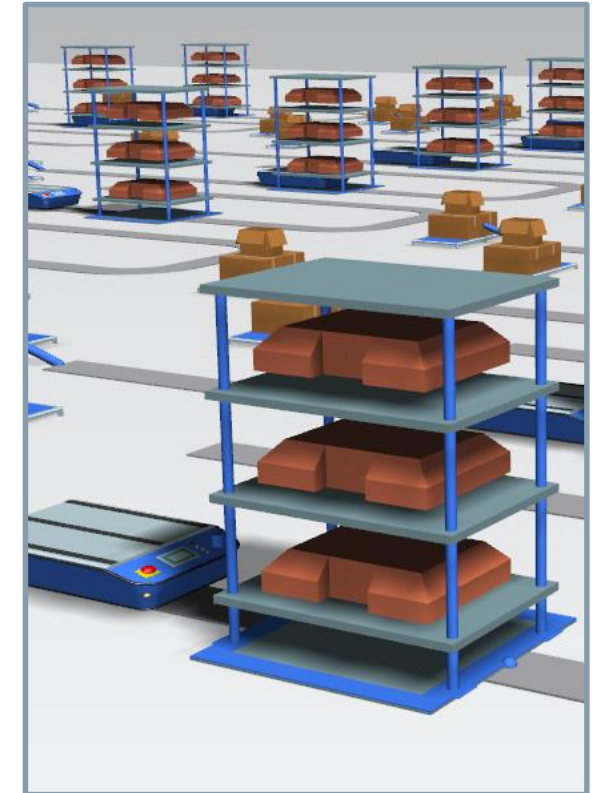
To match current customer requirements and state-of-the-art technology for AGV systems it is necessary to simulate/support vehicles driving independent from fixed track systems.

- Vehicles can drive on the shop floor
- A driving path can be assigned to a vehicle through a SimTalk API

With free moving AGV also virtual commissioning use cases are possible where e.g. a PLC based AGV fleet manager controls the AGV driving paths and orders.
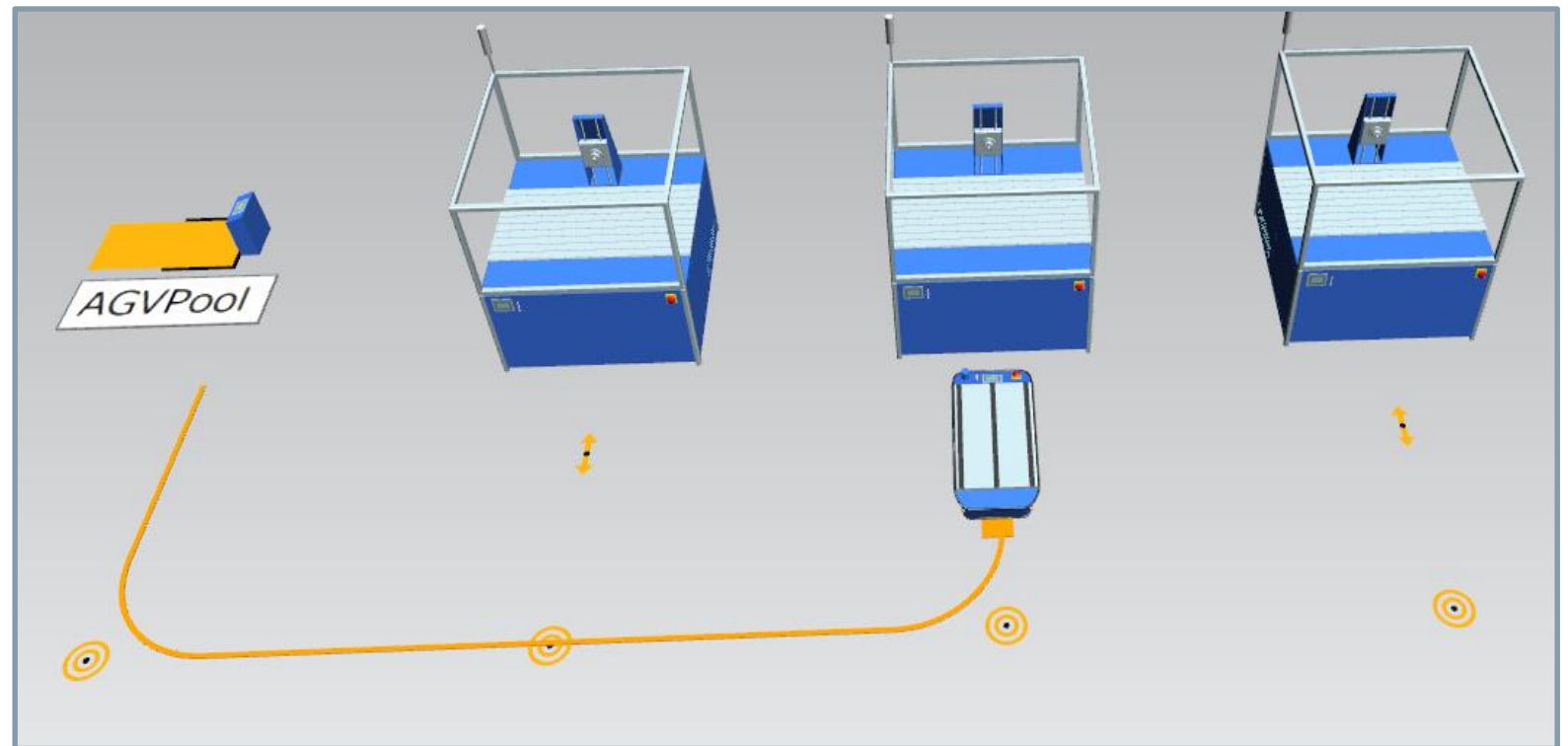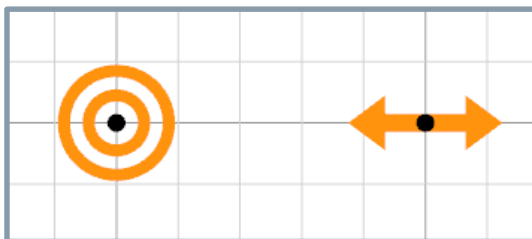
Customer Benefits:
- Increased flexibility for simulation of current AGV systems
- Enhanced capability for virtual commissioning of AGV control systems
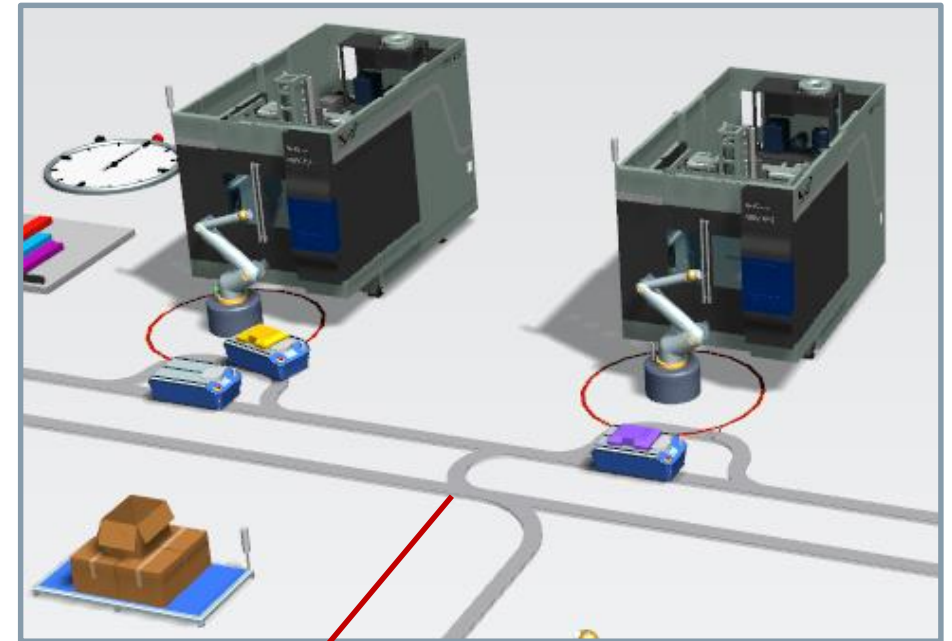
Get rid of modelling complex, fixed track systems

- No tracks needed anymore

- AGV driving on the floor

- AGV orientation along marker on the floor

- Use sequences of marker as driving route

New with Version 14.2:
# Automatic Part Routing on Lines and Machines

The automatic part routing offers an easy way to direct a part automatically to the next target station.

Customer Benefit:

- New powerful and easy-to-use routing strategy
- Reduced need for writing custom SimTalk code for standard part routing tasks

Achieved technical results:

- Fast and OOTB strategy
- Easy combination with already existing strategies and custom SimTalk controls

Part Destinations:
M_1 / M_2 / M_3
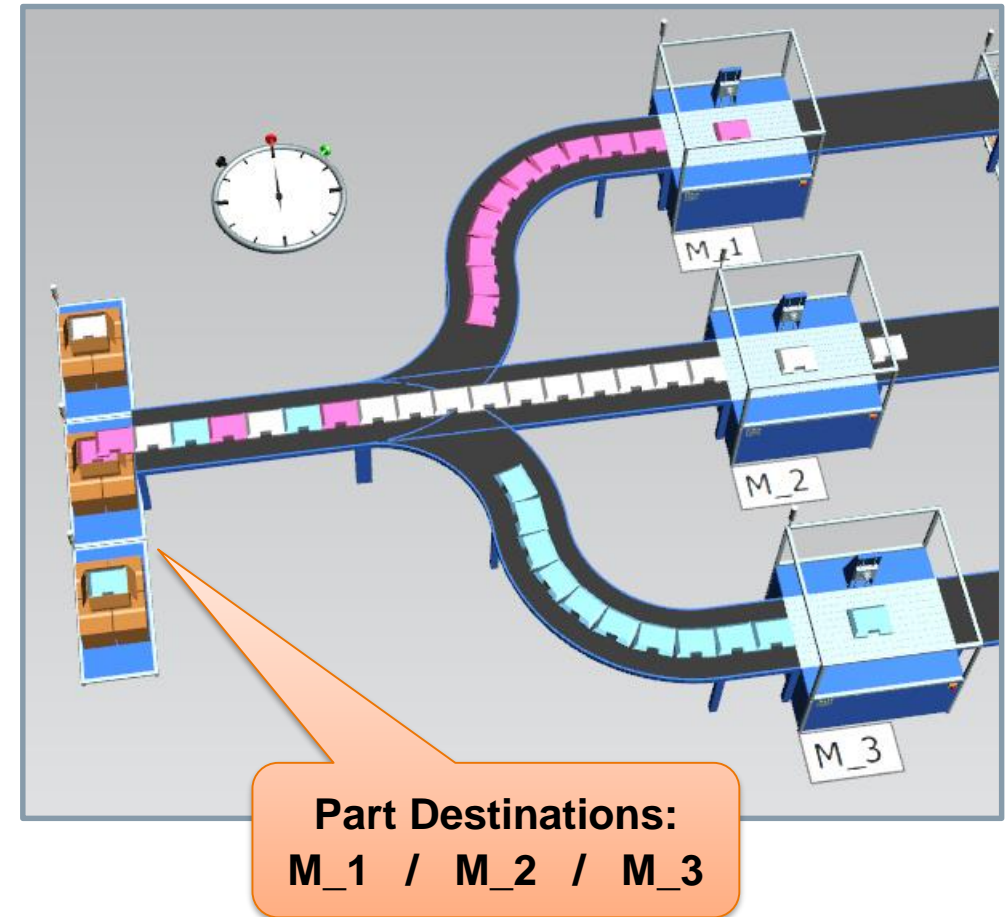
# Part Exit Strategies and Operator carrying Parts

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The standard part exit strategies on stations can now be used in combination with operators carrying parts to target stations selected through the exit strategy.

Customer Benefit:
- New powerful and easy-to-use part delivery to target stations
- Reduced need for writing custom SimTalk code for operators bringing parts to specific stations

Achieved technical results:
- Fast OOTB strategy combination
- Generalization of existing concepts covering more standard use cases in shop floor operations

Times	Set-Up	Failures	Controls	Exit	Sta

Strategy: ☐ Blocking
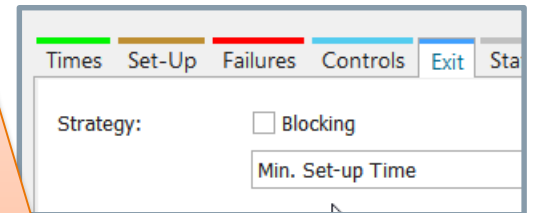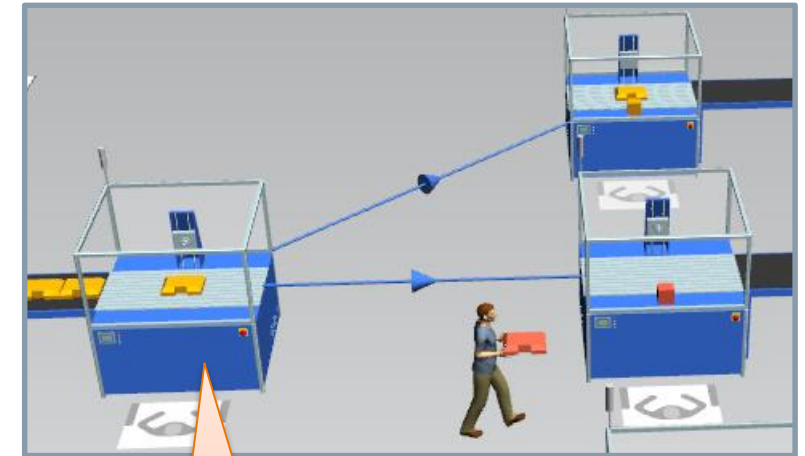
Min. Set-up Time

Example: Min. Set-up Time:
If possible carry part to a station where no additional setup is needed

New with Version 14.2:
## Part Routing and Operator Carrying Parts

The automatic part routing can also be used with operators carrying parts to their destination.
The next destination is defined through the pre-calculated part route on the shop floor.

Customer Benefit:

- New OOTB material routing strategy eliminating a lot of custom SimTalk coding

Achieved technical results:

- Fast and OOTB strategy
- Seamless integration with operators carrying parts on the shop floor
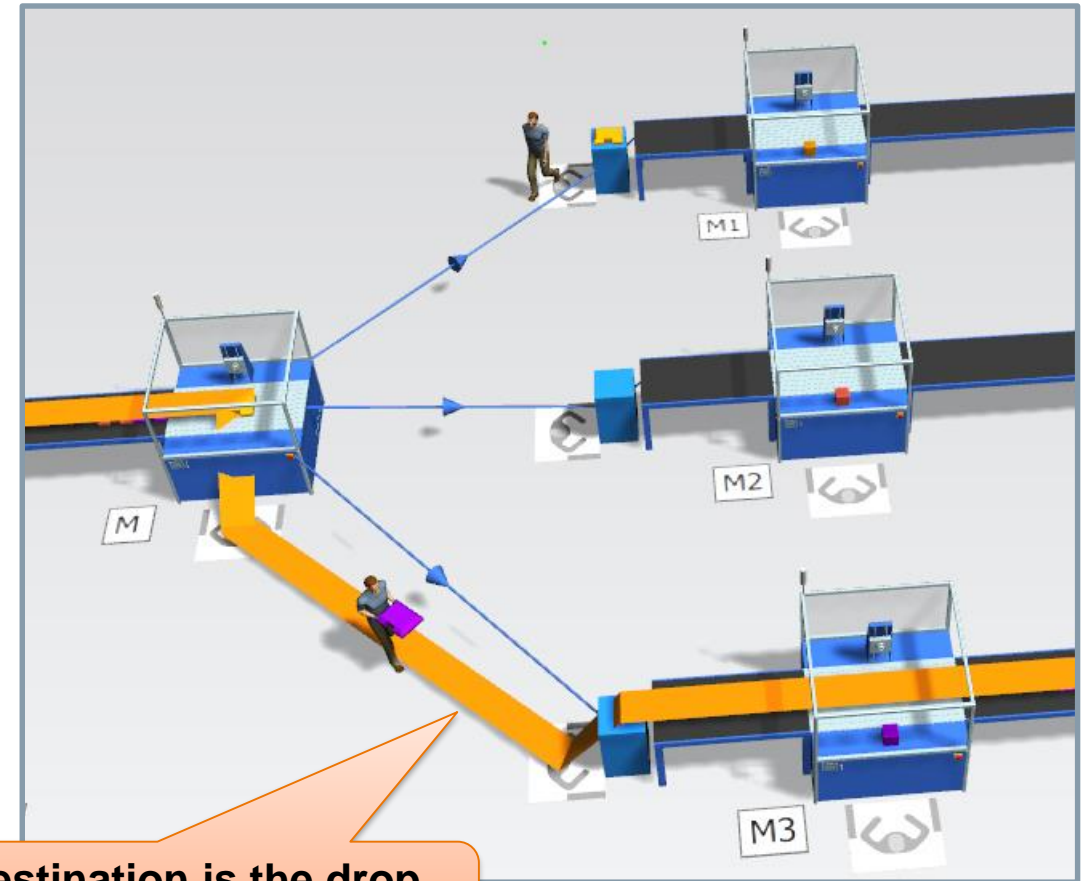
Next part destination is the drop place in front of station M3

New Sankey Diagramming Tool

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The Plant Simulation Sankey tool collects and displays part, vehicle and operator routes on the shop floor.
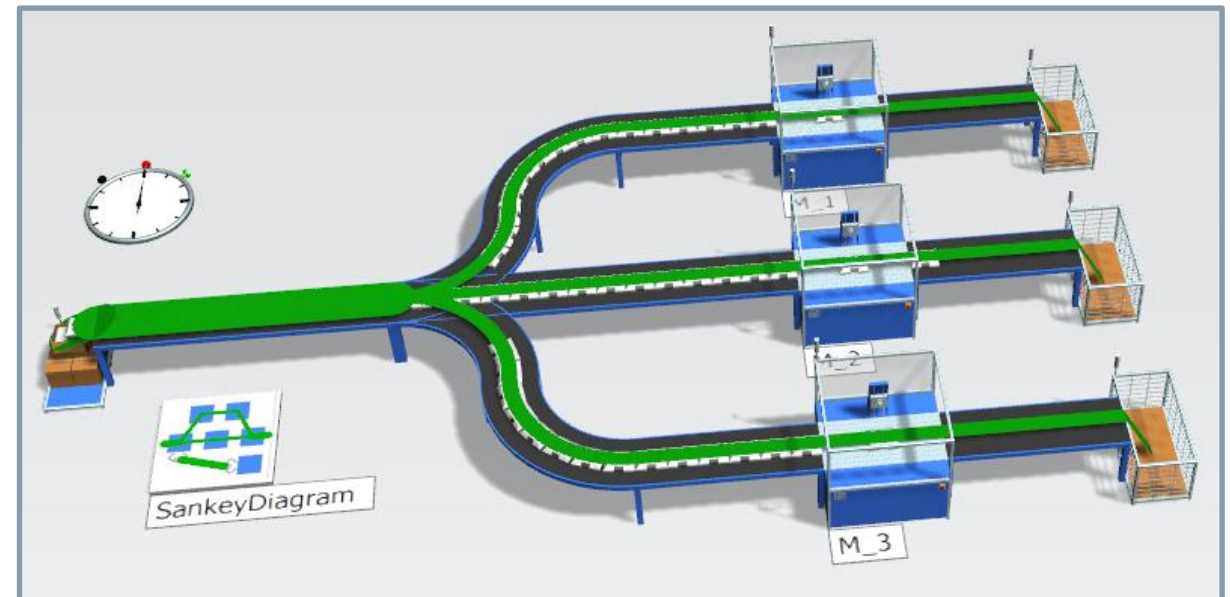
Customer Benefit:
- Easy validation of correct part routing
- Visualize heat maps for heavily used routes and machines
- Enhanced reporting capabilities

Achieved technical results:
- Improved Performance (factor 10+)
- Modern and state-of-the-art UI and look & feel
- Better fit to Plant Simulation use cases
- Replacement for outdated SimTalk based Sankey implementation
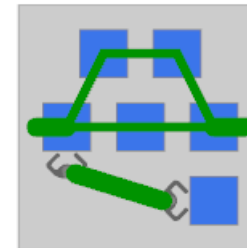
SankeyDiagram

New Pose Editor for Kinematic Definition (Joint Info/Demo fehlt...)
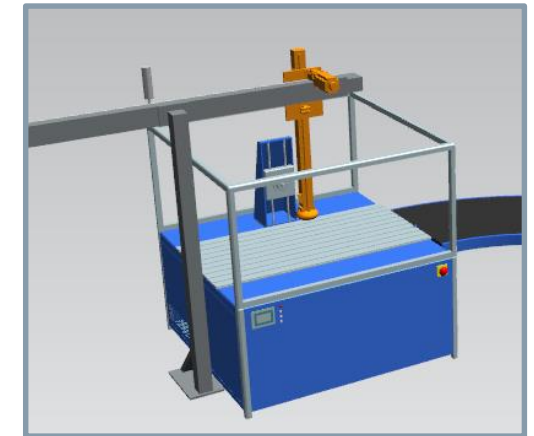
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The Plant Simulation pose editor introduces an easy way for the definition of animated machine modules and equipment

Customer Benefit:
- Easy 3D animation for machines with realistic behaviour
- Impressive technology presentation for customer, management and industry fairs

List of defined poses and pose preview in 3D view

Achieved technical results:
- Improved ease-of-use for advanced machine animation
- Infrastructure for standardized PL kinematic reuse and exchange

Edit dialog for pose definition and modification

User Experience Enhancements and Improved Workflows
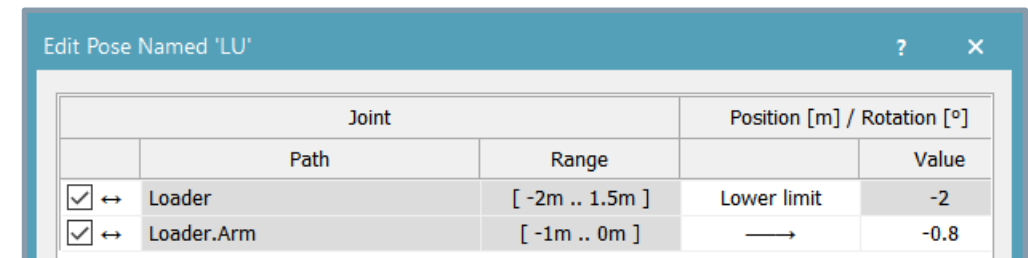
- 3D manipulators for fast interactive
  - Object scaling
  - Rotation

- Anchor points and additional manipulators for connectors in 3D

- New 3D bottling conveyor graphics with guides for Food & Beverage, CPG, …

- Part stacking feature from V14 is now used for all simulation objects with part capacity >1:
  ➔ Worker, Place Buffer,…
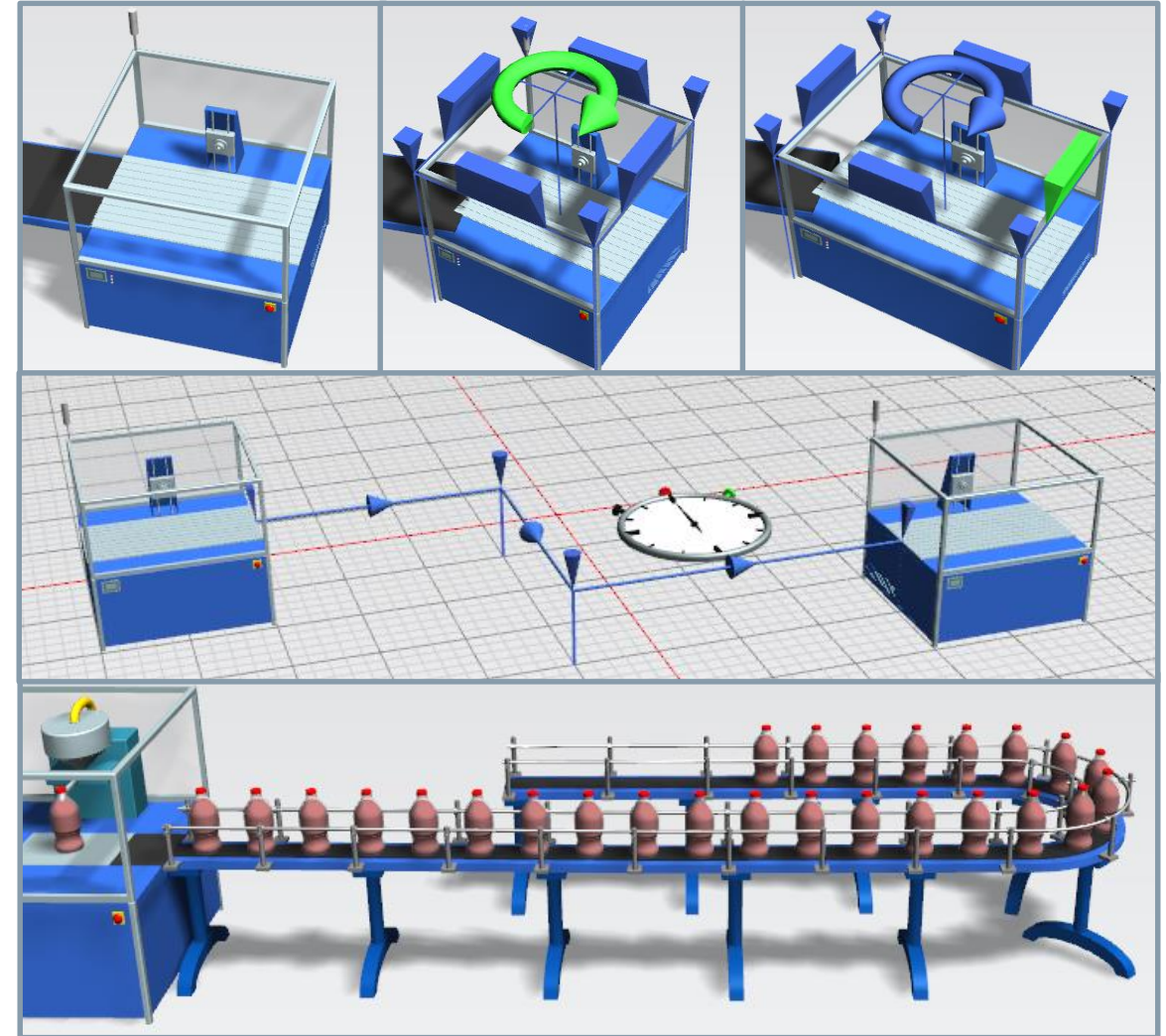
Simulation Based Costing

- Introduce cost attributes for production cost evaluation to Plant Simulation
  - Equipment costs
  - Maintenance costs
  - General costs, not equipment specific
  - …
- Cost evaluation and reporting added to simulation studies

.Models.Frame.TCPP

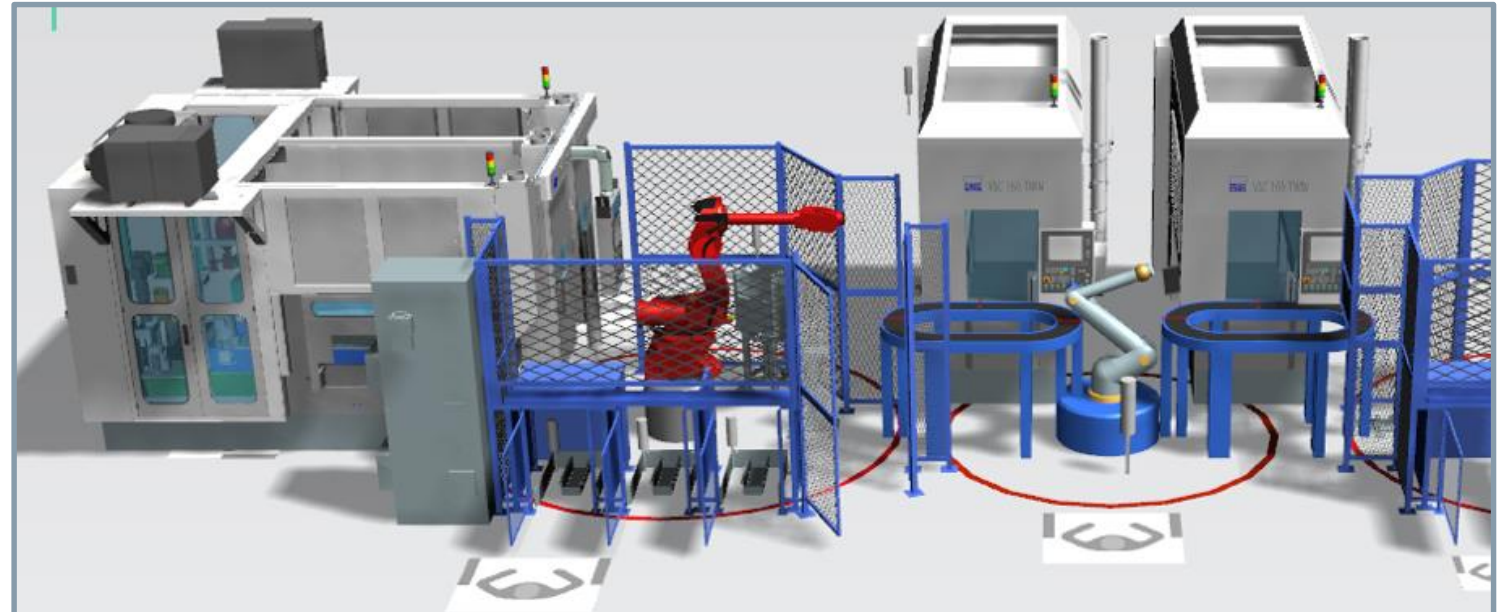**Total Costs per Piece with Increasing Output**
Compared Machines

— OP30
— OP_Replacement
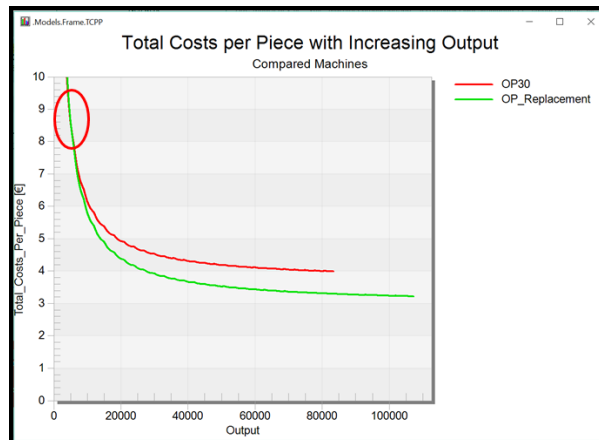
General:
- Straight-line Depreciation across 10 Years
- 200 €/m² occupancy costs per Year

Whole Production line
- Setup time: 2h
- Investment costs: 1. Mio €
- Equipment costs   r Rate: 54 €/h
- Machine Hour Rate: 63 €/h
- Tooling costs: 7000 €/a

Example:
## Simulation Based Costing: 2-Shift vs. 3-Shift, use 2 or 3 Machines, …

Plant Simulation Costing Report

Object	Investment costs [€]	Depreciation period [years]
Model2_Assembly	3153600.00	
∟ Station	525600.00	1.00
∟ Station1	525600.00	1.00
∟ Station2	525600.00	1.00
∟ Station3	525600.00	1.00
∟ Station4	525600.00	1.00
∟ Station31	525600.00	1.00

Investment costs

MU Type	Piece costs [€]	Material costs [€]	Accrued costs [€]	General costs [€]	Throughput	Work in process
P1	10.20	0.20	10.00	0.00	263043	1
P2	14.31	0.30	14.01	0.00	262554	3

Piece costs
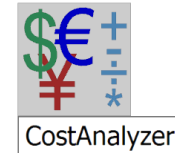
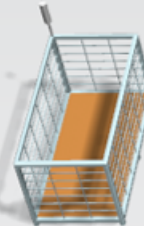Calculation of **costs per piece** based on cost parameter and simulation results:
- Machine utilization
- Produced parts
- Labour hour rates
- …

CostAnalyzer

Simulation Time: 1 Year

2-Shift-Mode	3-Shift-Mode
Output: 56004	Output: 83395
Direct Labor Hour Rate: 37,76 €/h	Direct Labor Hour Rate: 39,75 €/h
Costs per Piece: 11,91 €/Stk.	Costs per Piece: 11,49 €/Stk.

New with Version 14.1:
Gantt Chart Migration to Plant Simulation Core

The Plant Simulation Gantt Chart collects and displays
- machine allocation by parts
- machine state display like "working", "set-up", "failed", ...

Customer Benefit:
- Improved validation of part routing
- Visualize impact of machine states on production performance
- Enhanced reporting capabilities

Achieved technical results:
- Improved Performance (factor 10+)
- Modern and state-of-the-art UI and look & feel
- Better fit to Plant Simulation use cases (tool tip information, 100% integrated)
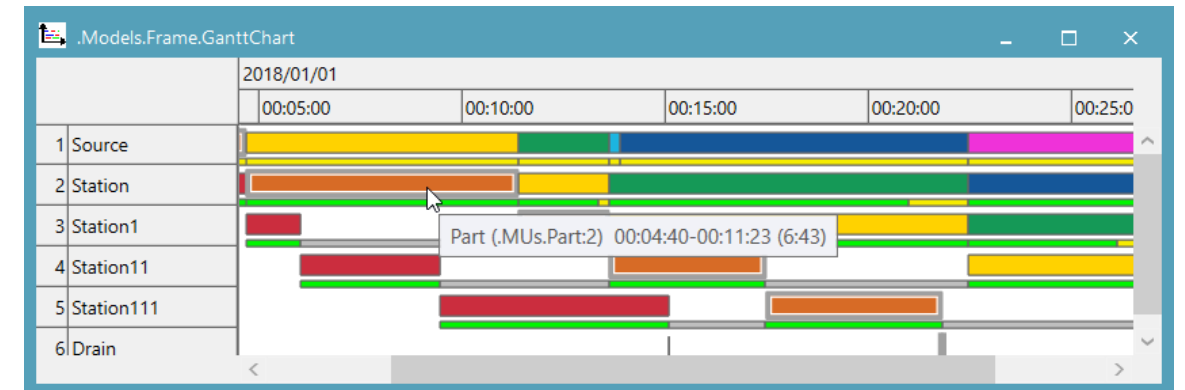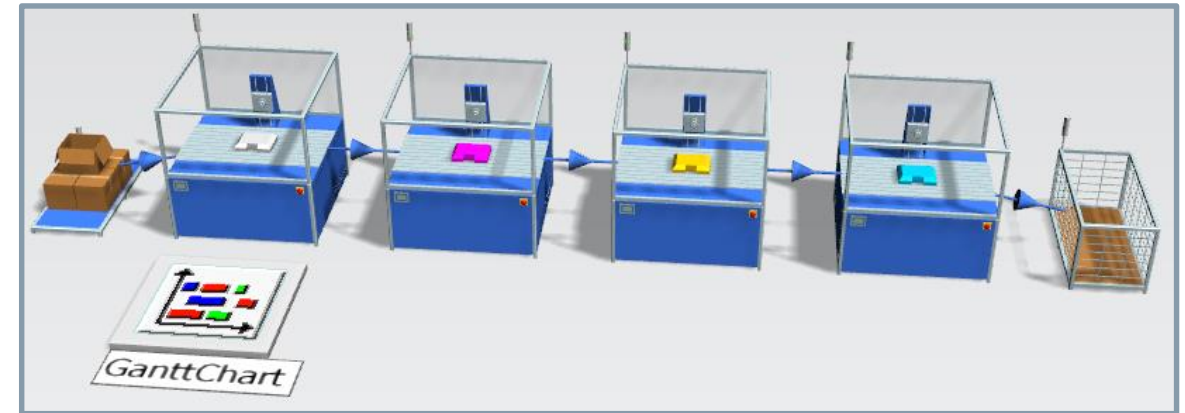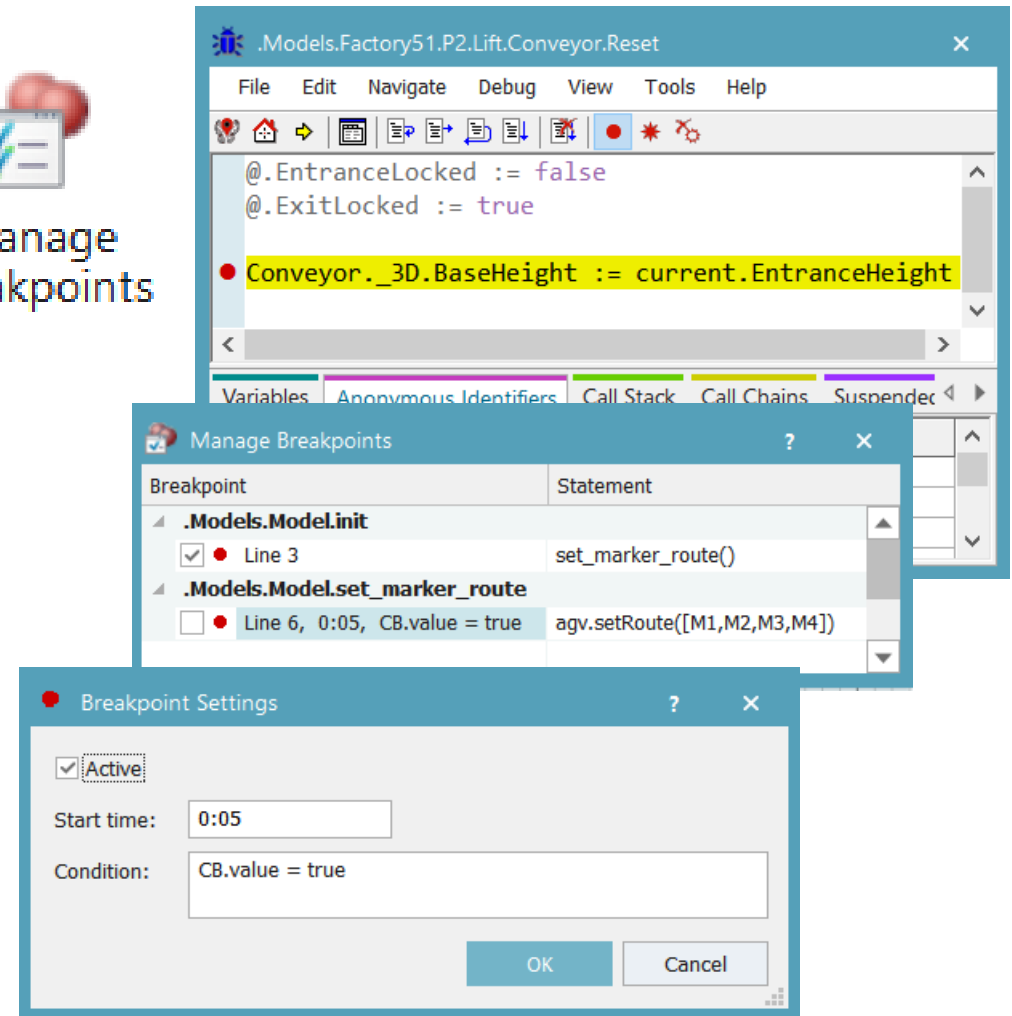
New with Version 15.0:
SimTalk Breakpoint Management

Conditions for breakpoints are a powerful enhancement for debugging session in SimTalk controls:

- Define conditional breakpoints, based on current simulation model state
- Define start time for detailed step-by-step analysis

Customer Benefit:
- More flexibility and user control in debug sessions
- Improved workflow for fast search and detection of critical simulation modes states

Manage Breakpoints

.Models.Factory51.P2.Lift.Conveyor.Reset

File   Edit   Navigate   Debug   View   Tools   Help

```
@.EntranceLocked := false
@.ExitLocked := true

Conveyor._3D.BaseHeight := current.EntranceHeight
```

Variables Anonymous Identifiers Call Stack Call Chains Suspended

Manage Breakpoints

Breakpoint	Statement
.Models.Model.init	
☑ ● Line 3	set_marker_route()
.Models.Model.set_marker_route	
☐ ● Line 6, 0:05, CB.value = true	agv.setRoute([M1,M2,M3,M4])

● Breakpoint Settings

☑ Active

Start time: 0:05

Condition: CB.value = true

OK   Cancel

New with Version 15.0:
## Creating 3D Simulation Layout from Line Designer Layout

The new tool **Teamcenter Wizard** guides
Plant Simulation user in setting up a 3D simulation
model by reusing Line Designer or manufacturing
layouts and manufacturing operations managed in
Teamcenter.

Customer Benefit:
- Easy start for simulation studies using
  Line Designer layouts
- Best-practice for working with data from
  Teamcenter

Achieved technical results:
- Automatic layout rebuild according LD layout
  (managed in Teamcenter)
- 100% based on standard TC interface
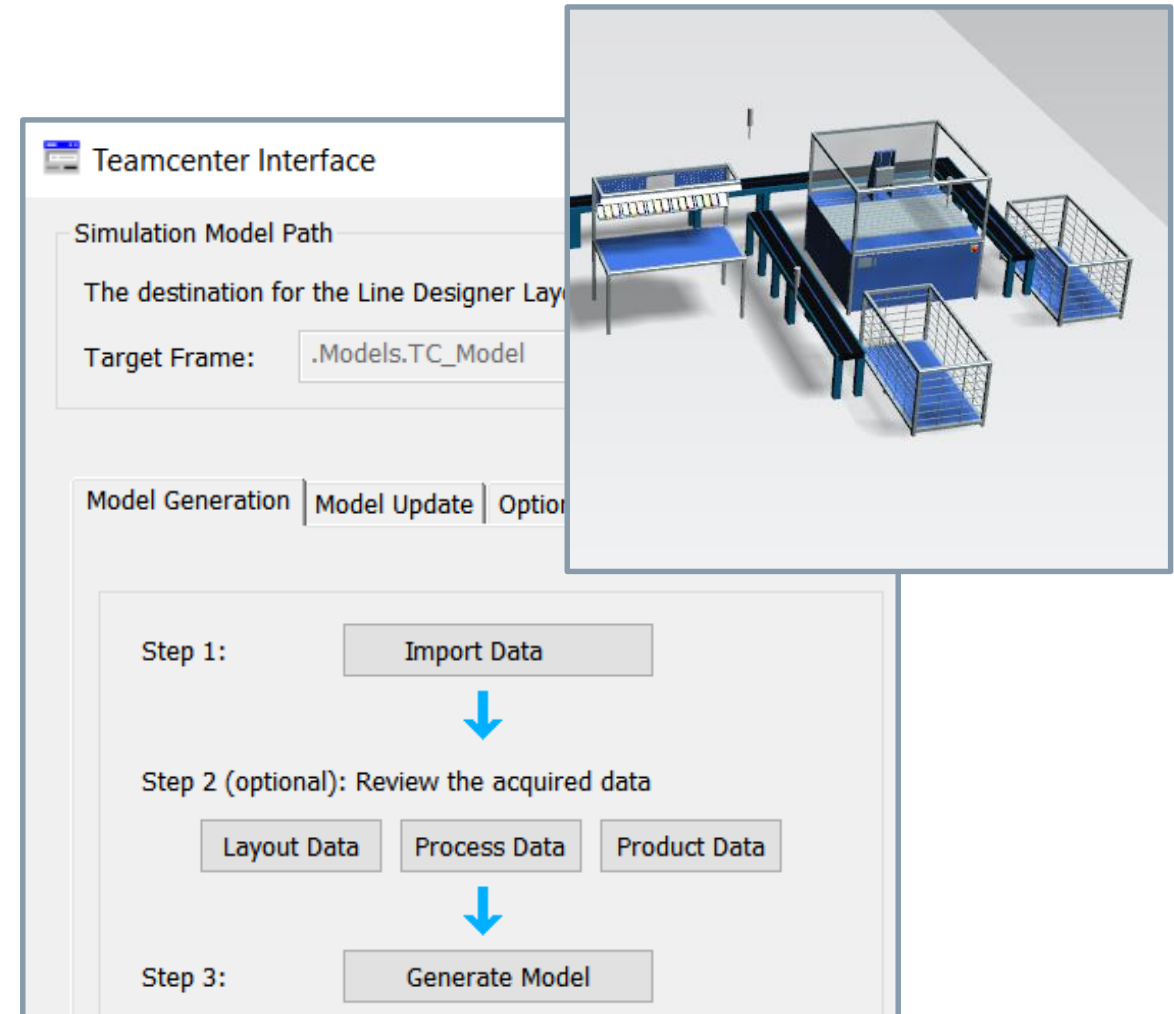
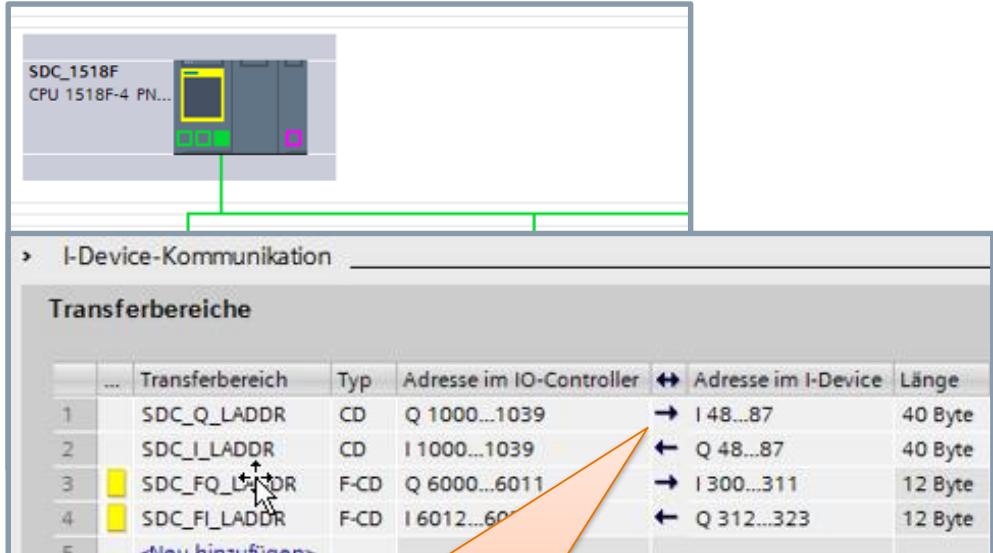# PLCSIM Advanced 2.0 Support and Address Access to PLC I/O

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Plant Simulation supports the latest virtual PLC version from Siemens.

Address based access to PLC I/O is a mandatory data exchange pattern and often used in automation projects.

(i-Device communication, see picture…)

Customer Benefit:

- Ability to use the newest virtual Siemens PLCSIM Advanced 2.0
- Enhanced flexibility in VC projects with more than one PLC

Achieved technical results:

- Support state-of-the-art Siemens technology
- i-Device communication can be used without changing PLC code in VC scenarios.

		Transferbereich	Typ	Adresse im IO-Controller	↔	Adresse im I-Device	Länge
1		SDC_Q_LADDR	CD	Q 1000...1039	→	I 48...87	40 Byte
2		SDC_I_LADDR	CD	I 1000...1039	←	Q 48...87	40 Byte
3		SDC_FQ_LADDR	F-CD	Q 6000...6011	→	I 300...311	12 Byte
4		SDC_FI_LADDR	F-CD	I 6012...60	←	Q 312...323	12 Byte
5		‹Neu hinzufügen›					

Each vehicle is mapped to a 40 byte data area in the PLC I/O segment, providing vehicle command parameter
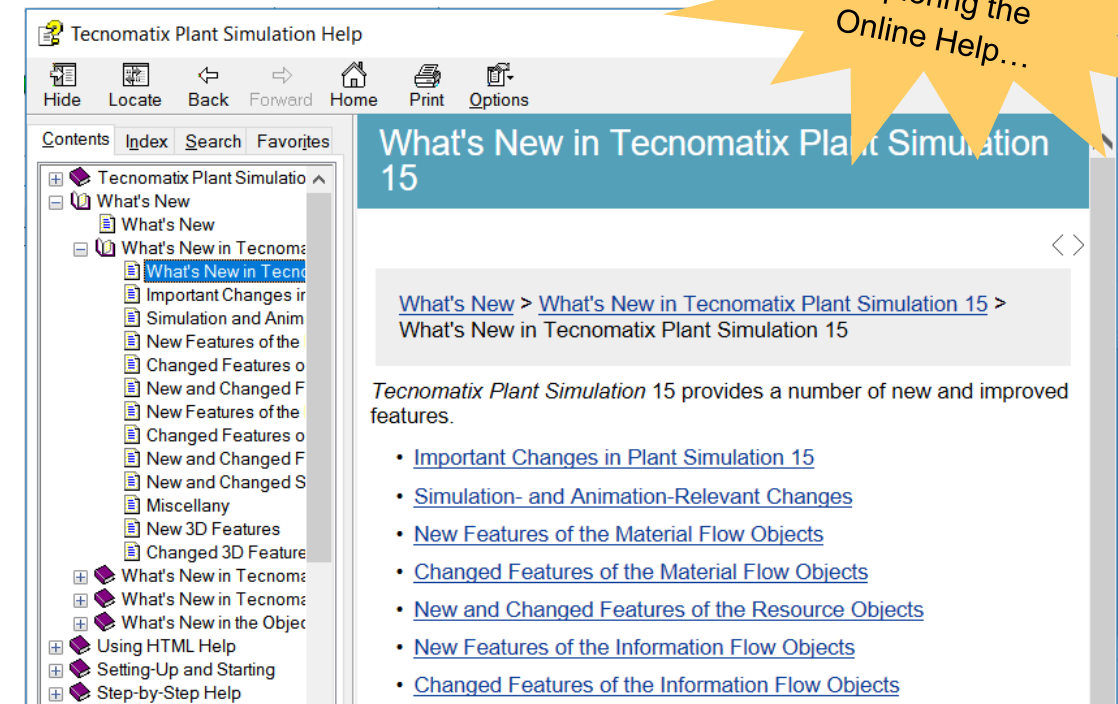
New with Version 14.1:
Additional Topics…

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- Object alignment in 3D

- Delayed routing decision point for converter / conveyor crossing

- Direct assignment to array variables: *position := [27, 5, 0.5]*

- Improved blocking statistic for conveyor lines
  - Percentage for exit blocked

- …

More information on all enhancements with version 15.0 Online Help!

Find more by exploring the Online Help…

- New HDI display support for high resolution displays

- Delayed start of part processing on stations

- Use of sensor positions as destination setting for Pick&Place robots in SimTalk API

- Single-Sign-On (SSO) for the Teamcenter Interface

- Fast search in array variables provides the new method
  array_variable.contains(<value>)

More information on all enhancements with version 15.0 Online Help!

Find more by exploring the Online Help…
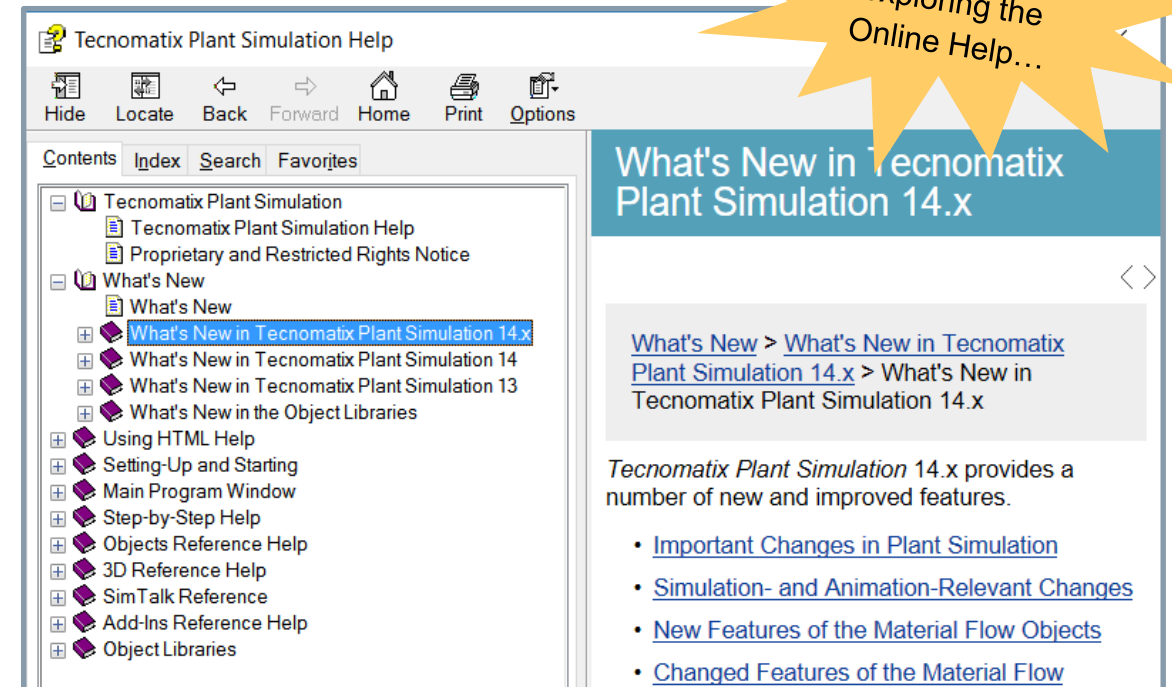
New with Version 15.0:
Additional Topics…

SIEMENS

- Sensor activation with MU booking point

- Workpiece Carrier:
  machines operate on a loaded part instead of carrier…

- 3D connectors with anchor points, layout modifications via manipulators

- Default Model Optimization:
  - 3D graphics,
  - Classes library

More information on all enhancements with version 15.0 Online Help!

Find more by exploring the Online Help…

Contact

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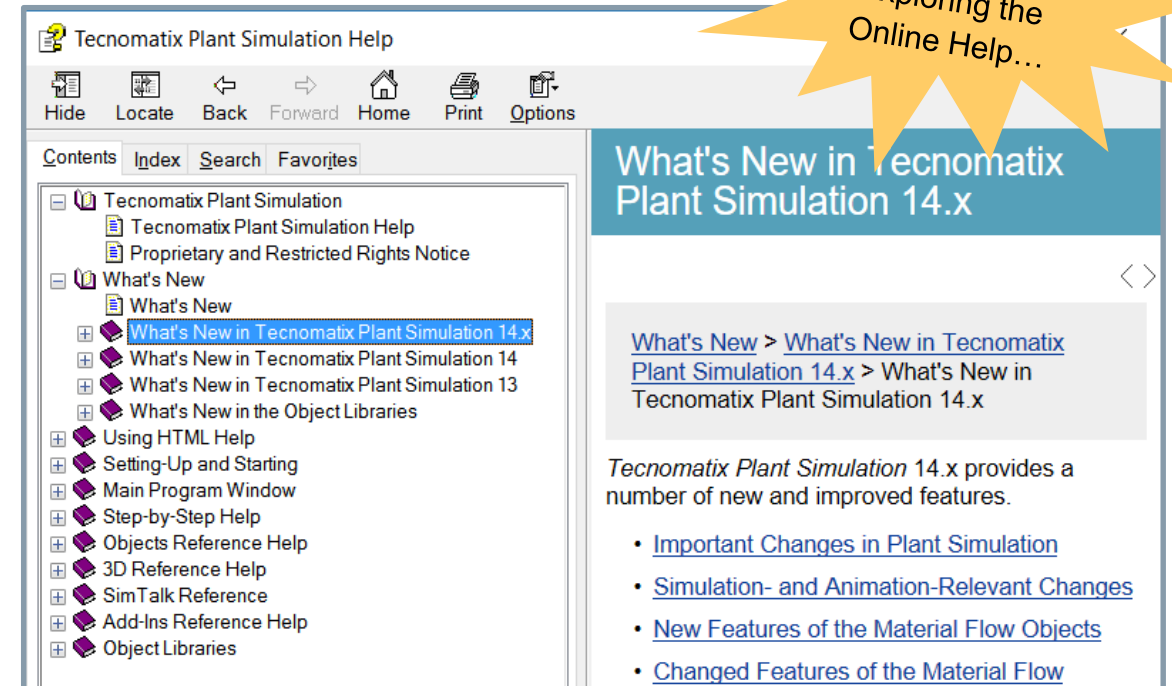
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