Plant Simulation

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Tecnomatix Plant Simulation

Developer(s)	Siemens PLM Software
Stable release	Tecnomatix Plant Simulation 15 / 2019 [1]
Operating system	Windows 7&8 32 bit + 64 bit /Windows XP/Vista
Type	Discrete event simulation
License	Commercial
Website	Plant Simulation

Plant Simulation is a computer application developed by Siemens PLM Software for modeling, simulating, analyzing, visualizing and optimizing production systems and processes, the flow of materials and logistic operations.[2] Using Tecnomatix Plant Simulation, users can optimize material flow, resource utilization and logistics for all levels of plant planning from global production facilities, through local plants, to specific lines. Within the *Plant Design und Optimization Solution* the software portfolio, to which Plant Simulation belongs, is — together with the products of the Digital Factory and of Digital Manufacturing — part of the Product Lifecycle Management Software (PLM). The application allows comparing complex production alternatives, including the immanent process logic, by means of computer simulations. Plant Simulation is used by individual production planners as well as by multi-national enterprises, primarily to strategically plan layout, control logic and dimensions of large, complex production investments.[3] It is one of the major products that dominate that market space.

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Product description

Plant Simulation is a Material flow simulation Software (Discrete Event Simulation; DES Software). Using simulation, complex and dynamic enterprise workflows are evaluated to arrive at mathematically safeguarded entrepreneurial decisions. The Computer model allows the user to execute experiments and to run through 'what if scenarios' without either having to experiment with the real production environment or, when applied within the planning phase, long before the real system exists. In general the Material flow analysis is used when discrete production processes are running. These processes are characterized by non-steady material flows, which means that the part is either there or not there, the shift takes place or does not take place, the machine works without errors or reports a failure. These processes resist simple mathematical descriptions and derivations due to numerous dependencies. Before powerful computers were available, most problems of material flow simulation have been solved by means of queuing theory and operations research methods. In most cases the solutions resulting from these calculations were hard to understand and were marked by a large number of boundary conditions and restrictions which were hard to abide by in reality.

Languages

Plant Simulation is available in English, German, Japanese, Hungarian, Russian and Chinese. The user can create individual Dialog boxes using double-byte characters and offering individual parameterizations. The user can switch between the available languages.

Special features

- Object-oriented programming with
  - Inheritance: Users create libraries with their own objects, which can be re-used. As opposed to a copy, any change to an object class within the library is propagated to any of the derived objects (children).
  - Polymorphism: Classes can be derived and derived methods can be redefined. This enables users to build complex models faster, easier and with a clearer structure.

    - Hierarchy: Complex structures can be created very clearly on several (logic) layers. This facilitates a Top-down and bottom-up design approach.
- Openness for importing data from other systems, such as Access or Oracle data bases, Excel worksheets or from SAP.
- Integration: Plant Simulation is part of the Digital factory and supports
    - importing data from PLM systems or be used during
    - Virtual Commissioning
    - taking over layout data from Autocad, Microstation, FactoryCAD, etc. directly into the simulation.
- Provides comprehensible analysis tools for detecting bottlenecks (Bottleneck Analyzer), for tracking the flow of materials (Sankey diagrams) or for detecting over-dimensioned resources (Chart Wizard).
- Provides integrated optimization tools:
    - The Experiment Manager automatically creates scenarios or evaluates dependencies between two input parameters.
    - Genetic algorithms search large solution spaces.
    - Neural networks show the connection between input and output parameters and can be used for forecasting.
- Data analysis: Detection of dependencies, Regression analysis, best fitting function etc.

Scope of application

Calculation of enterprise characteristics

Goal:

- Detect and show problems which might otherwise cause costs and time-intensive correction measures during the ramp-up phase.
- Offer mathematically calculated key performance indicators (KPI) instead of expert's "gut feelings."
- Reduce investment costs for production lines without endangering the required output quantities.
- Optimize the performance of existing production lines.
- Incorporate machine failures, availabilities (MTTR, MTBF) when calculating throughput numbers and utilization.

Visualization

Plant Simulation can display production sequences in 2D and in 3D. The 3D display is especially helpful as a sales tool or for in-house communication of planned measures. In addition it allows to present the entire system concept within a virtual, interactive, immersive environment to non-simulation experts.[4] The 3D engine is based on the industry standard JT format. CAD applications such as NX, Solid Edge can export models in this format. The 3D data files can be imported in the JT format '.jt' by using Drag-and-drop.

Used in

Plant Simulation is used in most industries. Especially in the

- Automotive industry[5] Automotive Industry Workgroup Material Flow Simulation[permanent dead link]
- Automotive suppliers
- Aerospace [6]
- Plant manufacturing
- Mechanical engineering
- Process industry
- Electronics industry
- Consumer packaged goods industry [7]
- Airports
- Logistics companies (transport logistics, storage logistics and production logistics)
- High bay warehouse suppliers, suppliers of automated guided vehicle systems and electric overhead monorail systems
- Consulting houses and service providers
- Shipyards[8] Simulation Cooperation in the Maritime Industries; SimCoMar is an interest group of shipyards and suppliers, universities and institutions engaged in the simulation of shipbuilding[9]
- Harbors, especially container terminals [10]

Lately material flow simulation gains growing importance through the increasing use for considering the sustainability of industrial production processes. Here the characteristics of sustainable manufacturing are simulated and analyzed beforehand and then integrated into the investment decision process.
Plant Simulation is also used for research and development purposes at a great number of universities and universities of applied science.

Application history

Year	Company	Product name
1986	The Fraunhofer Society for Factory Operation and Automation develops an object-oriented, hierarchical simulation program for the Apple Macintosh	SIMPLE Mac for Apple Macintosh
1990	AIS (Angewande Informations Systeme) founded	SIMPLE++ (Simulation in Produktion Logistik and Engineering)
1991	AIS renamed to AESOP (Angewande EDV-Systeme zur optimierten Planung)	SIMPLE++ (Simulation in Produktion Logistik und Engineering)
1997	AESOP acquired by Tecnomatix Ltd.	2000 SIMPLE++ renamed to eM-Plant

2004 Tecnomatix Ltd. acquired by UGS Corporation

2005 eM-Plant renamed to Tecnomatix Plant Simulation

2007 UGS Corporation acquired by Siemens AG[11]

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