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Siemens Digital Industries Software

A modern toolset for modular plant design

Enabling the automatic generation of complete pipe systems

solidedge.siemens.com

Process plant design can be expensive and time-consuming. Customer and regulatory requirements drive complexity in product development, manufacturing and field operations. Digitalizing plant data allows all stakeholders to access the same, up-to-date information. Modern day regulations require plant data to be stored digitally, with the plant owner/ operator acquiring and maintaining the data once a plant is commissioned.

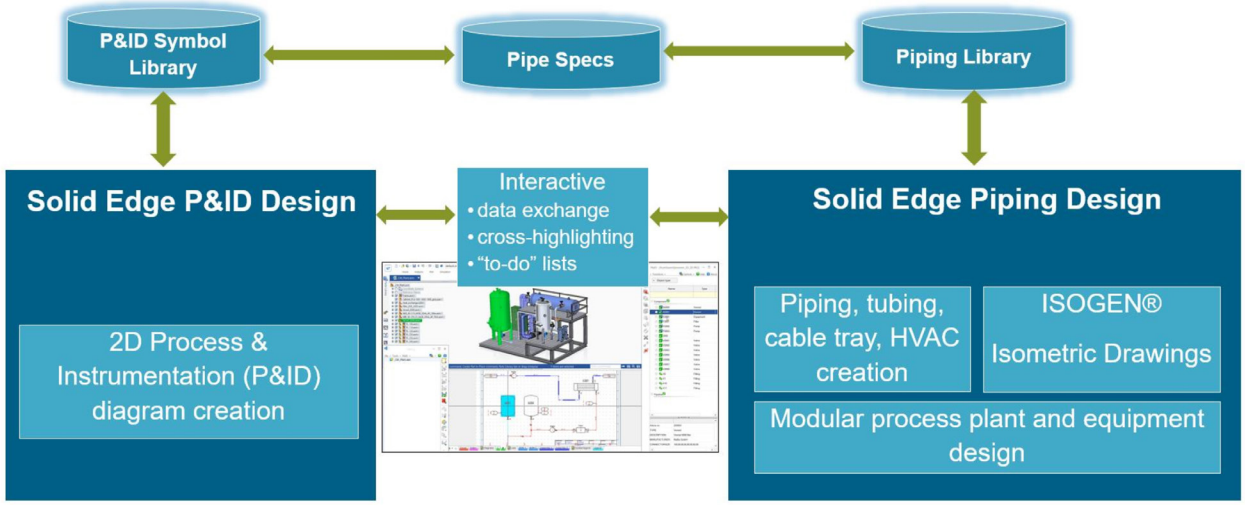
Digitalizing data has additional benefits, such as reducing the opportunity to introduce errors during part integration. Modular plant design is the practice of designing and manufacturing a process plant in discrete modules that are fabricated at the contractor's site. These modules are then shipped to the end-user's site and integrated into existing process plant installations. Errors can be introduced when process diagrams are converted to 3D piping designs. Integrating 2D and 3D plant design efforts through the use of digitization minimizes risk.

Modular plant design is an increasingly popular approach to process plant development, one that has proven successful in reducing manufacturing and installation costs.

A modern workflow

Modular plant design uses a modern workflow that starts with capturing the design intent in 2D piping and instrumentation diagram (P&ID) efforts. The holy grail of plant design, a P&ID is a detailed diagram that shows the piping and process equipment together with instrumentation and control devices. The P&ID schematic is the most important document in the workflow. The 2D P&ID diagrams can be used to create a bill-of-materials (BOM) for required parts and support early ordering of long lead time components.

The P&ID diagram is used to drive the design and layout of complex piping runs in a 3D computer-aided design (CAD) environment. Data from the isometric output is used to develop manufacturing instructions for pipes and assemblies. Fabrication piping drawings are used for manufacturing.



Solid Edge modular plant design solutions

From rudimentary 2D pipe planning to full-scale 3D piping systems, Solid Edge® software for modular plant design streamlines workflow processes. Most plant design solutions offer no automation from 2D to 3D, leading to huge costs to redesign and redraw everything from scratch. The Solid Edge solution allows users to easily capture design intent/logic in a 2D schematic, then develop 2D P&IDs into a comprehensive 3D model of a process plant. Linked 3D piping, support for P&ID and Isogen output (which automates piping isometric drawing production) ensure your products are designed right the first time, every time.

It's easy to get started using Solid Edge 3D design software through free 2D drafting software and free thirty-day trials available on solidedge.com. Qualifying startups are eligible for a free annual subscription, which includes access to modular plant design capabilities. The Solid Edge for Startups program is available globally with no application fee.

Solid Edge P&ID Design

Solid Edge P&ID Design software is used to create, change, manage and review 2D flow schematic diagrams. This database-driven, standalone package provides the user with all relevant charts, diagrams, drafts, design checks and reports. Drawing sheets, project sheets and report templates are completely customizable. Frequent and repetitive tasks are automated and simplified.

Systems and components (containers, pumps, fittings) are not drawn to scale but are represented as 2D graphical symbols containing nongraphical data. Pipelines are represented by connecting lines marked with nominal width, pipe specifications, IC number (tag) and more.

P&IDs are crucial for meeting company and international quality standards. Solid Edge P&ID Design software, which is part of the Xcelerator™ portfolio, the comprehensive and integrated portfolio of software and services from Siemens Digital Industries Software, supports American National Standards Institute (ANSI)/International Standards Association (ISA), German Institute for Standardization (DIN) and European Norm International Organization for Standardization (EN ISO) standards. It connects seamlessly to Solid Edge Piping Design where its definitions control automated 3D pipeline creation. Features that are defined in P&ID can be easily placed into a 3D model to provide a complete modular plant design solution.

Integrating 2D symbols and geometry
In addition to using the symbol libraries such as the ISO, DIN, ANSI and ISA built into Solid Edge P&ID Design, the user may integrate other symbols (2D geometry in DXF or DWG format) or use the tool's symbol generator to conveniently and quickly create new ones. Symbols may be placed using grid points and are scalable. When it is placed in a drawing and/or built into a line, the symbol will automatically align with the correct orientation. The turning of symbols and line separation is entirely automatic. Tag numbers and further characteristics are also prompted automatically.

Dynamic piping lines
Solid Edge P&ID Design makes drawing and processing pipelines easy. By automatically separating or closing, lines respond dynamically to the addition or removal of symbols and/or components, negating the need to rework lines manually. These smart lines allow the flow direction display to be easily turned on and off. All symbols that have already been placed in the line progression are automatically turned when the flow direction is changed. Lines can be changed (lengthened, shortened, moved) with the use of handles.

A drawn line becomes a logical pipeline after the features are assigned (pipeline number, pipe spec, diameter, etc.). All the available information about the pipeline can then be envisioned from the drawing.

Design checks for validation
Design checks can be used to review individual P&ID drawings as well as the entire project for plausibility and accuracy. Examples of design checks include flow direction check, duplicated or missing tag numbers and conformity of the diameter at the connection point. The flexible software structure enables quick and easy addition of customized design checks.

Evaluations and reports
Project sheets and exported data for BOMs and evaluations can be produced from the assembled project information (symbols, components and pipelines). The following formats are supported for export and their contents are completely customizable templates: XML, Excel spreadsheet software, comma or a text file.

From 2D to 3D
Although Solid Edge P&ID Design is a standalone 2D solution, it can be integrated with Solid Edge Piping Design software or used with Solid Edge 3D design products. The to-do list functionality provides an online or integrated connection between the P&ID and a 3D assembly. In the to-do list, the available definitions created in Solid Edge P&ID Design can be transferred to a Solid Edge assembly where it controls automated 3D pipeline creation.

Capture the design intent and logic in a 2D schematic **P&ID**

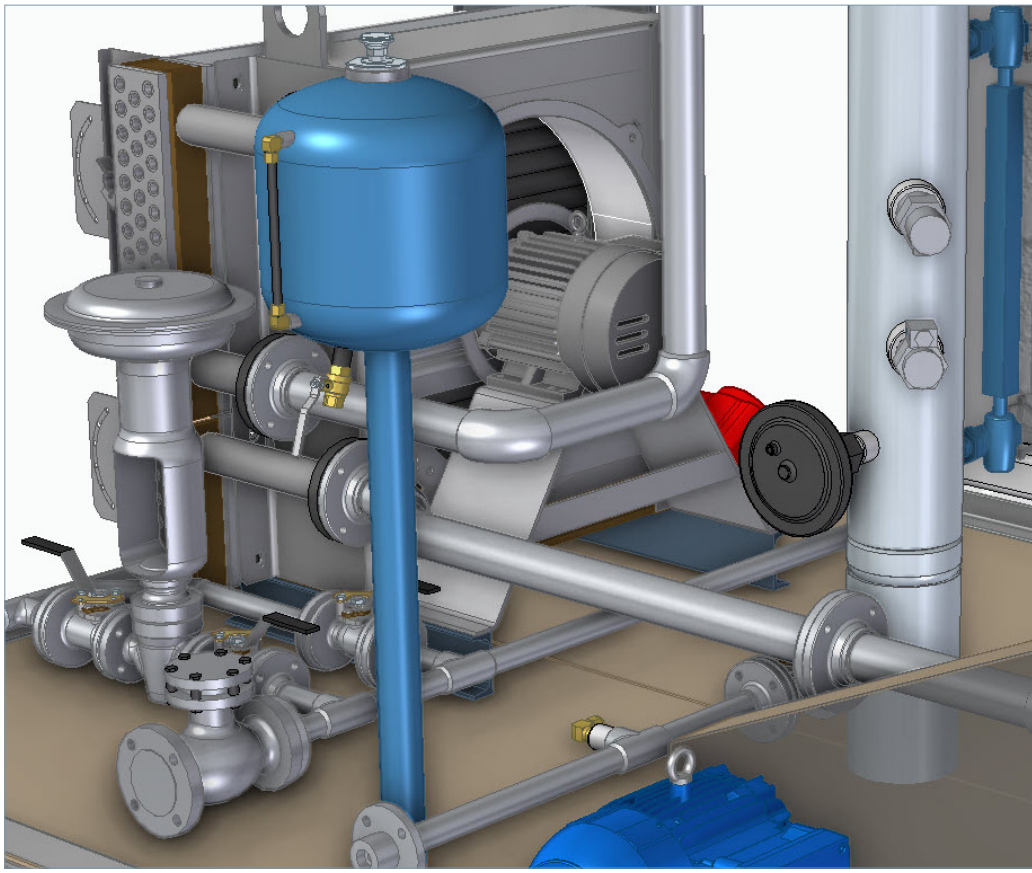
Create the digital twin in 3D based on the P&ID **Piping Design**

Manufacturing instructions for pipes and assemblies **Isometric Output**

Solid Edge Piping Design

As a link between P&ID efforts and a 3D design environment, Solid Edge Piping Design software automates 3D pipeline planning, making your Solid Edge system a robust 3D plant engineering solution. It automatically generates the complete piping system according to the required pipe spec and its diameter, as well as other pipe system characteristics. In the process, the software enables you to automatically place the fittings necessary (for example, bends, tees, flanges, gasket) for the pipeline route for multiple situations. This saves time and enhances process reliability.

Tubes and hoses of the same length in different assemblies – even if they are flexed differently – maintain the same BOM number, reducing erroneous manufacturing and ordering downstream. The software includes functionality that allows faster packaging design and includes enhanced 3D piping sketch functionality that allows even inexperienced users to easily create 3D sketches. It provides comprehensive 3D part libraries and fully automated Isogen output via PDF format for plant design, a task that would otherwise have to be done manually in multiple labor-intensive steps. Solid Edge Piping Design works as a standalone or as an add-on to Solid Edge 3D design software.



Basics of 3D pipeline planning
Solid Edge Piping Design uses pipe specifications as the basis for its highly automated 3D piping design functionality. The software comprises all necessary functions for construction, maintenance and management of pipe spec definitions using a pipe spec editor. Pipe spec samples are delivered with the software. These can be used directly or modified according to individual requirements.

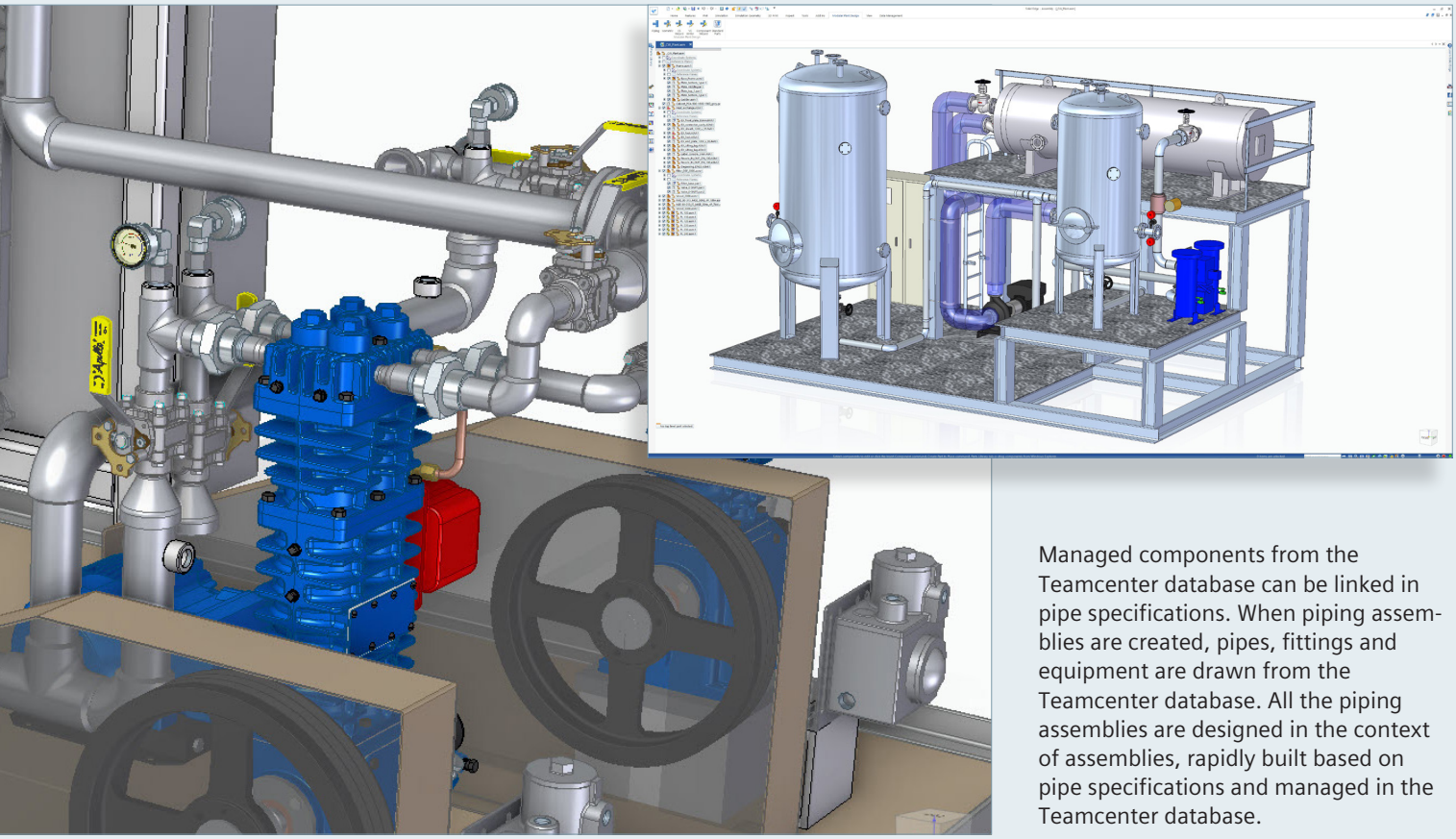
The software enables you to check necessary parameters, such as maximum and minimum pipe lengths for connections, then uses this information to automate the creation of the pipe assembly. This facilitates the maintenance and management of pipe specifications and prevents errors or the use of incompatible equipment. Pipe specs are stored in a central location. Specification tables, with project-specific characteristics and parameters, can be used to pass internal software plausibility checks. Once 3D isometric diagrams are created and approved, they can be used for manufacturing.

Pipe isometrics
An isometric drawing shows a simplified version of the pipeline, with all content and dimensions in lengths, width and height, and with the major axes of these three dimensions intersecting at an angle of 60 degrees. This type of drawing is not to scale.

Isometric software is included in Solid Edge Piping Design. Pipe isometrics are automatically generated from the Solid Edge 3D assembly and are provided in DXF, DFT, DRW or DGN output formats. The software installation comes with 10 predefined styles, which can be used directly or modified according to specific requirements.

During the isometric drawing process, the parts lists can be recognized and processed by the integrated Isogen. Various parts lists, for example, material lists, can be automatically output to a merchandise management system, either on the drawing and/or as an ASCII file.

Pipe specifications
Industrial pipe specs for Solid Edge modular plant design solutions significantly simplify and speed up pipeline design. This add-on product contains predefined pipe specs for different industries and sorts them according to various characteristics, which allows plant engineers to quickly find the appropriate pipe spec for individual adaptation.



Solid Edge XpresRoute

Solid Edge XpresRoute is used for more simplistic piping design, particularly in designs with a limited number of pipes or where there are no complex rules and standards. It streamlines the design of mechanical routed systems in a 3D environment, creating pipe and tube routes for the most efficient design. The tool automatically produces bend tables that can be directly used by tube bending machines. All modeled components are fully supported by Solid Edge drafting functions, including dimensioning for pipe and tube lengths and radii, and angular dimensioning between path segments.

Routing begins with the creation of a fully associative path for the routed components to follow. Solid Edge XpresRoute helps designers specify these paths by quickly defining 3D variational sketches using specialized modeling aids.

Accurate reporting
Solid Edge XpresRoute boosts productivity and reduces costs even after the design is complete by automatically creating detailed reports, BOMs and other valuable purchasing and manufacturing information. Accurate cut lists and component BOMs can be created for piping systems, either directly from the assembly or on a Solid Edge drawing.

Teamcenter integration

Modular plant design software supports the management of all libraries' components in Teamcenter® software, with control over revisions, releases and even marking components as obsolete. The standard part library interface allows users to manage libraries in structured ways that help them find components easier and replace or re-use the components across different assemblies.

Managed components from the Teamcenter database can be linked in pipe specifications. When piping assemblies are created, pipes, fittings and equipment are drawn from the Teamcenter database. All the piping assemblies are designed in the context of assemblies, rapidly built based on pipe specifications and managed in the Teamcenter database.

Optional piping library

In addition to the baseline of piping components delivered with Solid Edge, the Solid Edge piping library is available. It contains an extensive selection of standard fittings, including elbows, bends, returns, Ys, tees and reducers, as well as a large collection of essential components such as flanges, unions and seals. Fittings are available in a variety of relevant end treatments, such as threaded, welded, flanged and slip-on treatments.

Standards

Solid Edge modular plant design software supports ANSI/ISA, DIN and European Norm International Organization for Standardization (EN ISO) standards to meet strict governing requirements.

For more information, please visit: https://solidedge.siemens.com/en/solutions/products/3d-design/modular-plant-design/

About Siemens Digital Industries Software
Siemens Digital Industries Software is driving transformation to enable a digital enterprise where engineering, manufacturing and electronics design meet tomorrow. Our solutions help companies of all sizes create and leverage digital twins that provide organizations with new insights, opportunities and levels of automation to drive innovation. For more information on Siemens Digital Industries Software products and services, visit www.sw.siemens.com or follow us on LinkedIn, Twitter, Facebook and Instagram. Siemens Digital Industries Software – Where today meets tomorrow.

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