Solid Edge Version 16 extends top down and 2D-3D hybrid design, improves system design, and adds to its machine design capabilities

May, 2004

Prepared by
TechniCom, Inc.

TechniCom, Inc.
970 Clifton Avenue
Clifton, NJ 07013 USA
(973) 470 9110
http://www.technicom.com
staff@technicom.com

Solid Edge Version 16 extends top down and 2D-3D hybrid design, improves system design, and adds to its machine design capabilities

Introduction

In mid May, the author traveled to Solid Edge headquarters in Huntsville, AL to preview the changes due in Version 16 of Solid Edge. Douglas Stainbrook and Mark Thompson, Application Engineers, demonstrated and explained the features of V16.

Before we discuss V16, however, we should bring you up to date with some significant changes made in V15. Different than in previous versions, to run Insight, Solid Edge's exciting built-in PDM system, there is no longer a need to install an independent SharePoint Server (unless implementing a multi server environment). Microsoft now includes Windows SharePoint Services, a collection of services, along with Microsoft Windows Server 2003. These services allows users to create team-oriented Web sites to share information and foster collaboration with other users on documents. Solid Edge has integrated these into Insight along with support for MSSQL Server providing a real database foundation rare in this level of PDM. To see more about SharePoint go to http://www.microsoft.com/sharepoint.

This move lowers the entry price for the server infrastructure to about $3500 USD for Windows Server 2003 including an SQL server with 10 simultaneous accesses.

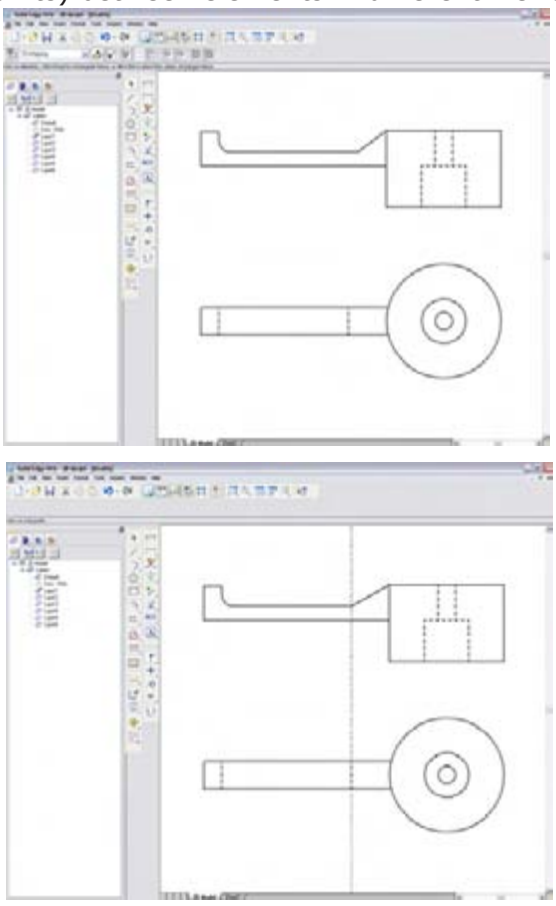
Solid Edge Insight at V15 also added the ability to manage and customize workflows, allowing management of processes for approvals and reviews of designs.

About V16

Solid Edge continues its focus on machinery and equipment design, consumer products design, and mold tooling, expanding each of these areas, as we shall see.

Improving 2D import and creation

Expanding on its ability to allow users to design in either 2D or 3D, V16 adds new capability in allowing users to migrate to 3D or to continue to design in 2D. Easing the pain of migrating from AutoCAD, V16 adds model space - paper space emulation. These tools allow users to design in 2-dimensional model space, then create scaled drawings in paper space. To aid in 2D model creation, projection lines extend existing geometry to "connect" or create relationships (constraints) between elements in different views.



The drawing on the top shows a drawing created in 2D Model Space. On the bottom, using Projection lines, users can create relationships between geometry in different views to keep them aligned. The hidden line was projected from the front view and a connect relationship created between the end of the angled line and the projected line in the top view.

Improvements in layer management, locking of related views, and bulk migration of drawings from Autodesk Mechanical Desktop round out the new capabilities.

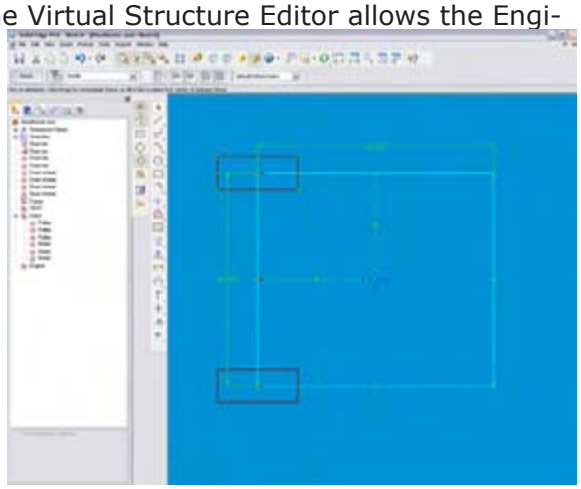
"Zero D"capability with Virtual Components adds to Hybrid 2D/3D Design

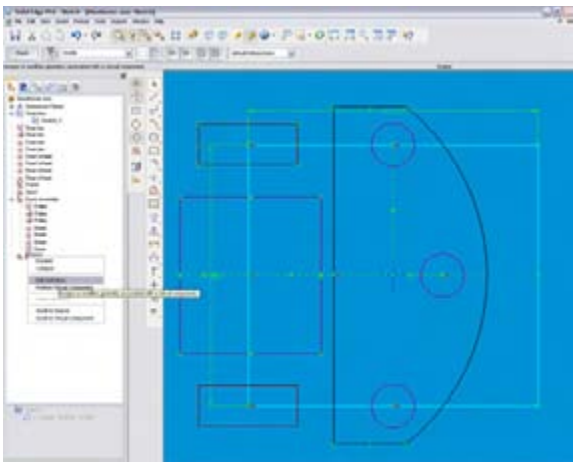
Often in machinery and even in product design, designs start with 2D layouts. In V16, Solid Edge advances this capability, enabling users to begin designs with no geometry, just with a product structure. This, so called Zero D (meaning no geometry) design proves to be an exciting concept for roughing out early stages of design.

Zero D design starts with a virtual component structure and allows us to build a design starting with a product structure tree. A component structure editor allows naming the parts and assemblies in the product. We can drag and drop the component into the proper places as we begin to expand the structure. We can also add subassemblies and move the components onto the correct levels of this pseudo BOM. Full property management can begin at this stage as well, filling in key properties for components that will be eventually be built. The goal, which the Solid Edge software appears to achieve nicely, is a flexible way of organizing your thinking, without having to commit to file structure on disk. Very important in the early design stages.

After the product structure is sufficiently organized, though not necessarily complete, we can build a 2D sketch layout, as in the examples below. We define a sketch and then relate individual geometric elements to specific items in the product structure, effectively creating 2D parts and subassemblies as "virtual components". The system automatically instances geometry to components with the same name. Changing the master component geometry changes all components with the same name. In the component structure, as we begin to define the geometry, the icons related to the specific components indicate that there is geometry related to them by up-arrows and whether they are referenced to other geometry by right-arrows on their icons in the structure tree. For larger images, where these icons are actually visible, users can go to http://www.cad-portal.com/eWeekly/product_reviews/SolidEdgeV16_WebGallery/index.htm.

The Virtual Structure Editor allows the Engineer to create a conceptual assembly (Zero D). The user can add virtual components - subassemblies and parts - without any associated geometry or "real" Solid Edge files on disk, as shown in the image on the top and above. The user can drag and drop components and rearrange the structure of the conceptual assembly. All this can be done without any layout sketches. The image directly above shows a design evolving from virtual components to a simple sketch, to a more advanced stage, even using actual parts.



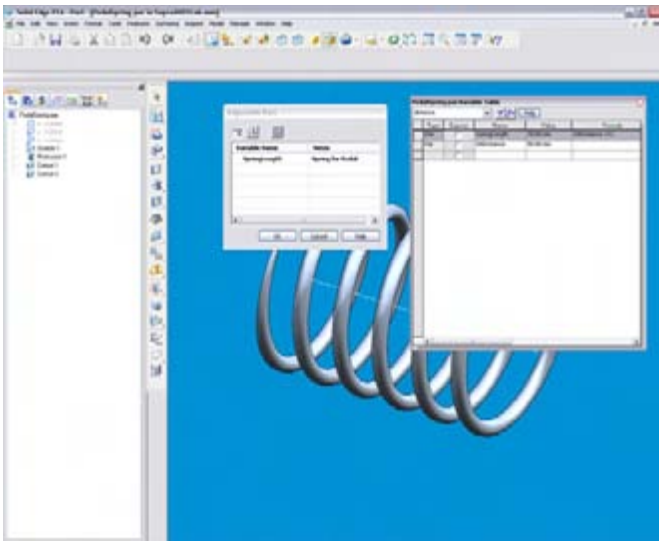


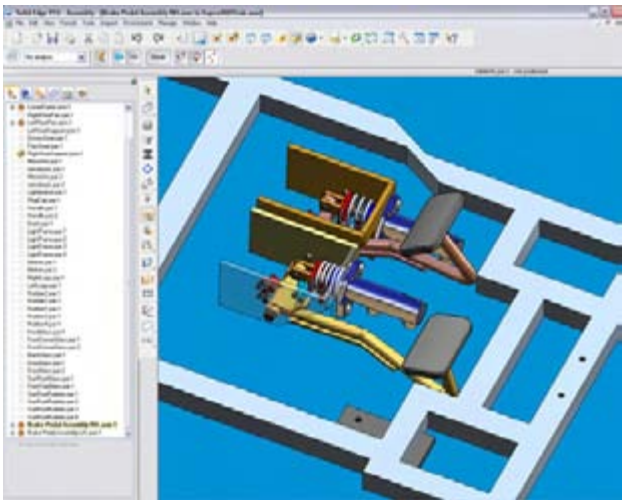
Thus far we have only built a virtual structure. No parts or assemblies have yet been defined. When this layout has gone as far as is practical, it comes time to "publish," which converts this virtual structure into a real Solid Edge assembly. The virtual structure is absorbed by the final Solid Edge assembly. The system generates actual parts on disk and automatically brings along the layout geometry from the virtual structure. Now the user can use the normal Solid Edge modeling tools to complete the final product.

This capability provides a significant enhancement for layouts that facilitates top down design. Better top down design is sorely needed in the industry and this greatly facilitates just that. Very impressive.

Adjustable parts are new in V16

Adjustable parts extend the concept of adjustable assemblies, introduced in V15. A primary example is a spring, but a bushing or rubber band might also constitute an adjustable part. In the part definition, we define, using the tools menu, that a part is adjustable. A dialog box lets us define how the part is allowed to adjust by selecting an "adjustment variable" within the part. For instance, in the case of a spring, we selected the length, which when changed, results in different spring compressions, assuming other constraints are met. In essence, this allows an under-defined part to be resolved by computing the adjustable variables to meet the imposed constraints. In the case of this spring, by "attaching" the front and back faces of the spring, within an assembly, the system solves the problem by varying the spring length to maintain these constraints. You can have many instances of the same part in the same assembly, each solved to a different compression length. Importantly, this doesn't involve any special configurations or extra part files. It is all accomplished without needing any extra files or writing back to the original file on disk.





Adjustable assemblies (introduced at V15) are defined using under-constrained assemblies. As in the case of an adjustable part, we need to define an assembly as being adjustable. In moving an adjustable assembly, the system will try to resolve the assembly change using one of the under constrained variables. One example of this would be a rod with a piston (like a shock absorber). There are many other examples. For more complex examples see Images 10 through 14 at the web site previously mentioned.

By using adjustable parts and assemblies users can get a much better visualization of how assemblies change dynamically. Note the figures below which depict a spring and i sdefinition and directly below that the same spring part in different adjustment modes. This capability avoids having to perform additional work for proper visualization.

Dynamic Families of Assemblies

The concept of assembly families allows users to combine multiple parts in a variety of ways to produce unique products. Families of Assemblies are comprised of components and variables assembled in multiple combinations to form a variety of alternative subassemblies. When creating a family, first we specify which components are interchangeable, thus defining an assembly that has different alternative component parts. These do not have to be a family of parts generated by altering variables within a part. They can be parts that can be interchanged for use in an assembly. Then, through a table-driven interface, complete with validation checking, we can specify family members that use a particular combination of parts, ensuring that our most common configurations are readily available to all users. During placement, Solid Edge Families of Assemblies allows the user to dynamically configure alternatives as needed,

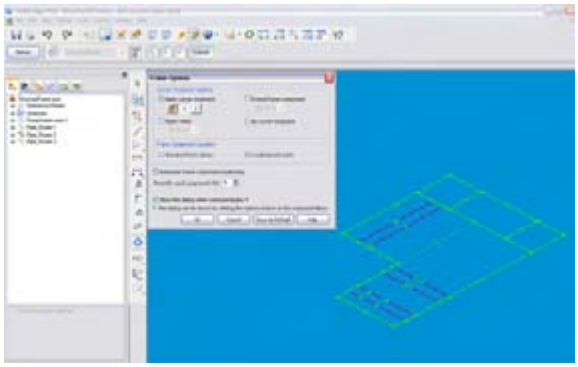
rather than having to specify all of them in advance. Subassemblies may be picked from a list of pre-selected alternatives, or dynamically configured during placement. This encourages reuse, but at the same time provides needed flexibility to define new members during placement.

Previous versions had a family of parts capability, however, the new alternate components technology, along with the table driven UI and dynamic configurations has really added to Solid Edge's already excellent systems design capabilities.

Adding capabilities to design process equipment - structural steel frame design and piping

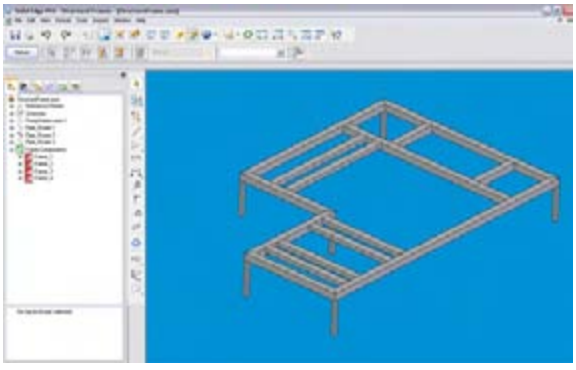
V16 adds new capabilities for the automation of piping processes by adding piping functionality to XpresRoute Tubing and Wiring along with structural steel frame design and enhancements to Sheetmetal.

To build a structural steel frame the user designs a 2D or 3D wireframe sketch of the frame, selects a cross section and after selecting appropriate options in the dialog box, the frame is automatically created, as illustrated

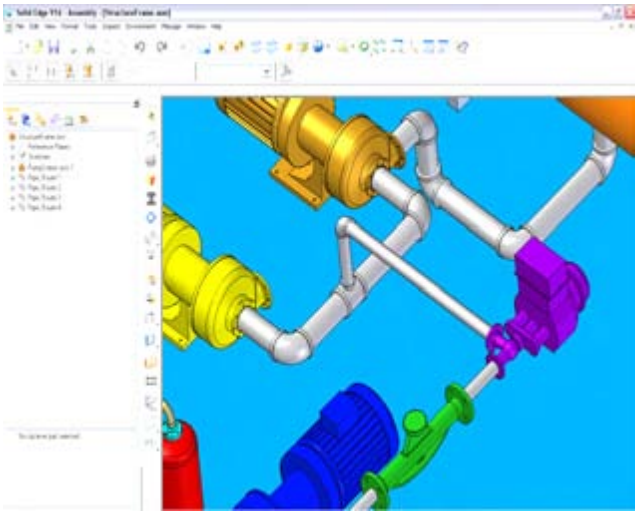


in the images below.

Cross sections are available in the part libraries, either those delivered with the system or added as user libraries. The system has the capability to automatically perform butt or miter connections of the frame members. After creating the frame, it automatically cuts each of the frame elements to the proper length. The system can produce the standard BOMs listing the frame members and cut lengths required to build the frame. The system has excellent control over section positioning relative to the path and automatic positioning considers previously placed frame elements; in our case, as shown below, when adding legs to the frame, the system automatically positioned them correctly by butting them to the outside corners.



Using XpresRoute, paths for pipes are defined and populated with proper pipes and fittings to create a virtual mockup of the piping system. Users can define their own pipes and fittings or purchase a more extensive collection of fittings optionally available in the Solid Edge Piping Library. Comprehensive reporting options are available for accurate cut lists and BOMs.



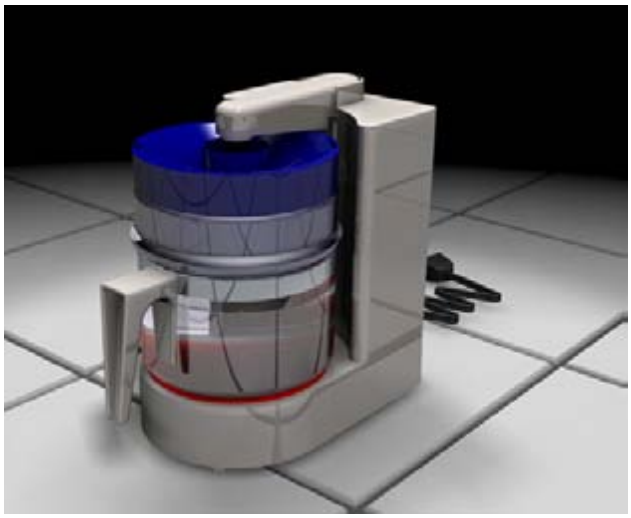
The image above depicts a sample piping mockup. V16 includes piping in its XpresRoute add-on package at the same price as before.

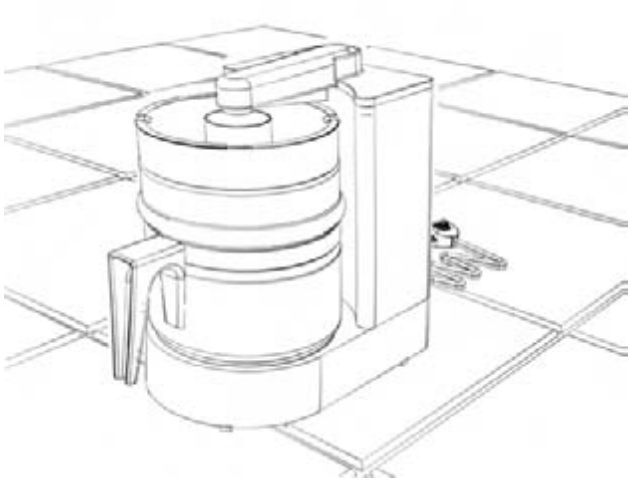
Rendering extended to realistic almost real time rendering

Virtual Studio remains free with the same capabilities as previously. Virtual Studio +, an additional product, costs $495USD node locked. What V16 delivers for this small additional cost is a very fast renderer with high end conveniences, including an extensive library of drag-and-drop materials, lighting studios, scenery, soft shadows and more.

We observed the 1280 by 1024 image shown below, computed and displayed with full shading, reflections, and shadows in less than 10 seconds.

In addition, the new application will support a unique artistic rendering solution for creating pencil drawn or cartoon-like artist renditions of CAD geometry for early stage visualization and concept reviews.





The images above show the outstanding quality of a sample rendering and its easily created pencil drawing.

Mold Design

At V15 Solid Edge introduced its new Mold Tooling package, extended in V16 to cover incremental mold standards, and adding custom mold base capability and features for defining runner bars, slides, lifters, inserts, stripper plates, and water channels, beyond existing support for ejector pins, steps, and gates. These enhancements allow Solid Edge to automate the design of a wide variety of plastic injection molds.

Conclusions

In spite of a difficult global economy in 2003, Solid Edge had substantial growth, due, no doubt, to their continuing progress in delivering high quality software that their customers need. Solid Edge Version 16 demonstrates their continuing focus on improving many of their leading edge technologies. V16 differentiates itself by expanding its hybrid 2D - 3D environment and continuing to add functions in other key areas. We particularly liked the Zero D ability, where users can begin to formulate a design without geometry and without needing to work in a PDM environment. New systems design capabilities, including adjustable parts and dynamic families of assemblies make working with complex products easier.

Structural steel design and piping, along with an extensive layout capability allow designing large machinery projects more easily.

Users wanting to move to Solid Edge from other CAD systems will find such a complex move made easier by the well thought out converters which provide bulk translations, and in the case of AutoCAD even provide a similar work environment.

While this release focuses primarily on design aspects, Solid Edge users continue to enjoy all the benefits of Insight, a sophisticated, yet simple system for advanced product data management provided within the base product.

About the author

Raymond Kurland is president of TechniCom and the editor of the TechniCom eWeekly. His firm specializes in analyzing MCAD systems and has been involved in reviewing and comparing such software since 1987. Ray frequently consults with both vendors and users. He can be reached at rayk@technicom.com.

Solid Edge contact information:
www.solidedge.com
Americas 800-807-2200
Europe 44 (0) 1202 243455
Asia-Pacific 852 2230 3333

TechniCom, Inc. - 970 Clifton Avenue - Clifton, NJ 07013 USA
(973) 470 9110 - http://www.technicom.com