SIEMENS

Ingenuity for life

Siemens Digital Industries Software

Transforming medical device design with NX

Learn how an intern removed the barriers to innovation

Today's medical device companies and suppliers must address increasing product complexity in the electronics and mechanical realm. The challenge? Medical devices are becoming so complex and personalized that product designers have no room for error or waste. To stay agile within the industry, product designers and manufacturers must adopt a holistic platform to drive innovation and speed to market.

NX delivers the next generation of design that enables you to deliver innovative products smarter and faster. NX provides a platform that is scalable, connected and collaborative. It provides solutions for electromechanical and generative design, integrated simulation and other core capabilities to improve the efficiency of medical device product design.

Enabling innovation

Using CAD software shouldn't be an inhibitor to building world-class products. NX has always been built with users in mind. To demonstrate how simple it is to bring products to life, a Siemens Digital Industries Software intern created an insulin pump using the most advanced design tools in NX. Imagine what your seasoned designers could do.

Design stages

> **Concept**

> **Case design**

> **ECAD and PCB design**

> **Simulation and analysis**

> **Product to market**

Concept

NX delivers a holistic design approach, integrating mehanical, electrical and electronic disciplines to enable designers to respond to quickly changing demands.

Hundreds of millions of people throughout the world are dealing with diabetes. The expanding need for diabetes management is pushing innovation forward within the insulin pump market.

On the product development side, an insulin pump demonstrates the complexities between the electronics and mechanical functionality of the device. The integrations and interworkings are common within the medical device industry. Disjointed mechanical and electrical design systems create issues with lost information and limited traceability and visibility of the impact of changes.

NX delivers a holistic design approach, integrating mechanical, electrical and electronic disciplines to enable designers to respond quickly to changing demands, increasing confidence in product performance.

Case design

Shaping

NX has multiple comprehensive tools for surfacing and shaping. NX Realize Shape™ software is a design method for advanced shape creation and is intuitive and easy to use. The insulin pump began with a primitive shape and then was manipulated to morph the shape as needed. The end product was a high-quality surface as an editable NX feature in greatly reduced time.

- Within this environment, methods of pushing and pulling points were utilized to manipulate and intentionally shape surfaces in limitless ways
- Utilizing symmetric modeling tools is an effective way to accelerate the modeling process while also developing a realistic and clean form
- In addition, orthographic images are helpful in recreating a pre-existing design, and guiding the pushing and pulling process

The first stage of this design was to enter into the Realize Shape mode. We started with a primitive shape most similar to the form we were trying to achieve. Utilizing symmetric modeling tools, along with transform cage mode, we manipulated the shape into our desired shape.

Surfacing

Once the form is generally in the desired shape, we refined the form with NX Realize Shape surfacing tools. Starting with the set continuity tool, edges of surfaces were made sharper or smoother. In addition, the edge blend tool smoothed out creases and created a more finished surface. These tools give a clear product vision to designers.

- Within NX Realize Shape there are multiple surfacing tools that allow the user to manipulate the form in very controlled ways

- The continuity tool provides the ability to sharpen or smooth a surface edge
- Edge blend allows the user to smooth out sharp edges

Building: Part I

Additional surfaces and bodies can be used to trim the main body. Reinserting into the NX Realize Shape mode, a rectangle was used to trim the original body to create a specific surface. Additional edge blending creates a more finished look.

- Using surfaces to trim forms is a unique and easily controllable way of manipulating a form

Rendering and surface analysis

Before continuing with the building stage, evaluating the surfaces of the current design can be accomplished using the surface analysis tools such as curvature, reflection and section analysis in addition to using different materials to see how the form appears with lighting.

- NX Ray Traced Studio is a valuable rendering tool within NX that not only helps to visualize the final product, but also to evaluate surfacing quality throughout the design process
- Assign the form a material and a scene, then enter the Ray Traced Studio to view a real-time photorealistic rendering of the form
- Experiment with materials to get a better idea of the form's appearance with lighting

Building: Part II

Using the horizontal XY plane on the datum coordinate system, the form can be split using the split body tool. Once the form is split, the halves are shelled. At this stage, any separate components of the design can be added, such as buttons or switches.

ECAD and PCB design

Once the shape of the design and its specific components were finalized, the shelled body was used as a reference to develop a printed circuit board (PCB). The need for different components such as buttons, switches, and screens was taken into account when building the board.

"NX enabled me to design this insulin pump remote by equipping me with a wide array of surfacing tools for refining the form along with the ability to complete multiple stages of the design process within the same software. By utilizing the visualization capabilities, I was able to analyze the surfacing throughout the design process and bring the product to life."

Siemens Digital Industries Software intern

Simulation and analysis

Complex internal electronic components present cooling challenges for designers. Simcenter FLOEFD™ software uses meshing technology that is recognized as the most efficient framework for simulating fluid flows, heat and mass transfer. In addition, the meshing process can be automated easily for even the most complex CAD geometries with the aid of SmartCells technology.

Additional surfaces and bodies can be used to trim the main body. Reinserting into the Realize Shape mode, a rectangle is used to trim the original body to create a specific surface. Additional edge blending creates a more finished look.
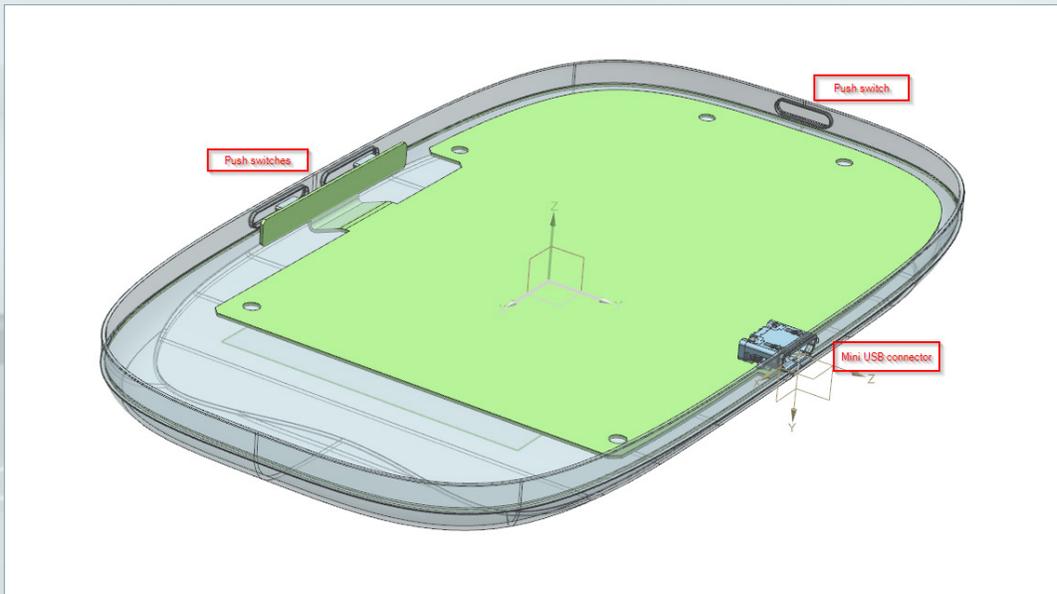
Tools utilized:

- NX Realize Shape
- Symmetric modeling
- Transform cage
- Raster images
- Set continuity
- Trim body
- Edge blend
- Surface analysis tools
- Split body
- Shell
- Sketch
- Extrude
- Subtract
- Advanced Studio
- NX Ray Traced Studio
- Simcenter FLOEFD

Product to market
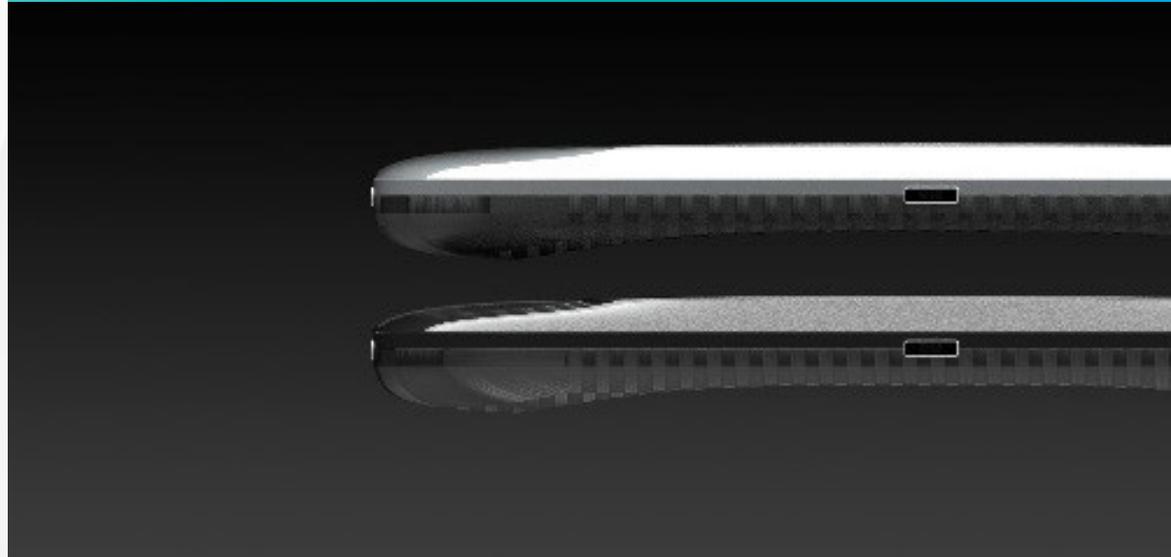
NX makes it easy to iterate products to cater to desired markets and users. With just a few modifications to the look and feel, companies can penetrate a whole new market. Want to sell to athletes? Perhaps a carbon fiber casing would be attractive. NX opens the door to these possibilities.

Ingenuity is NX

Evolving expectations require companies to evolve and innovate their design processes. NX provides the most comprehensive design solution to transform your design strategies. Developing products to provide the highest level of care to end users can keep medical device designers and suppliers up at night.

NX enables organizations to help shape the future of medical device design and provide solutions that improve the lives of patients around the world.

In an evolving and rapidly changing market, NX enables medical device companies to fully realize innovation.

Siemens Digital Industries Software community network

Taking engineering education and training to the next level

Have a question about NX? Want to interact with other NX users? The NX Design forum facilitates collaboration among engineers, designers, administrators and users to help answer questions and share lessons learned. It's an easy way you can get help from (or give help to) your fellow NX software users and expand your network of resources.
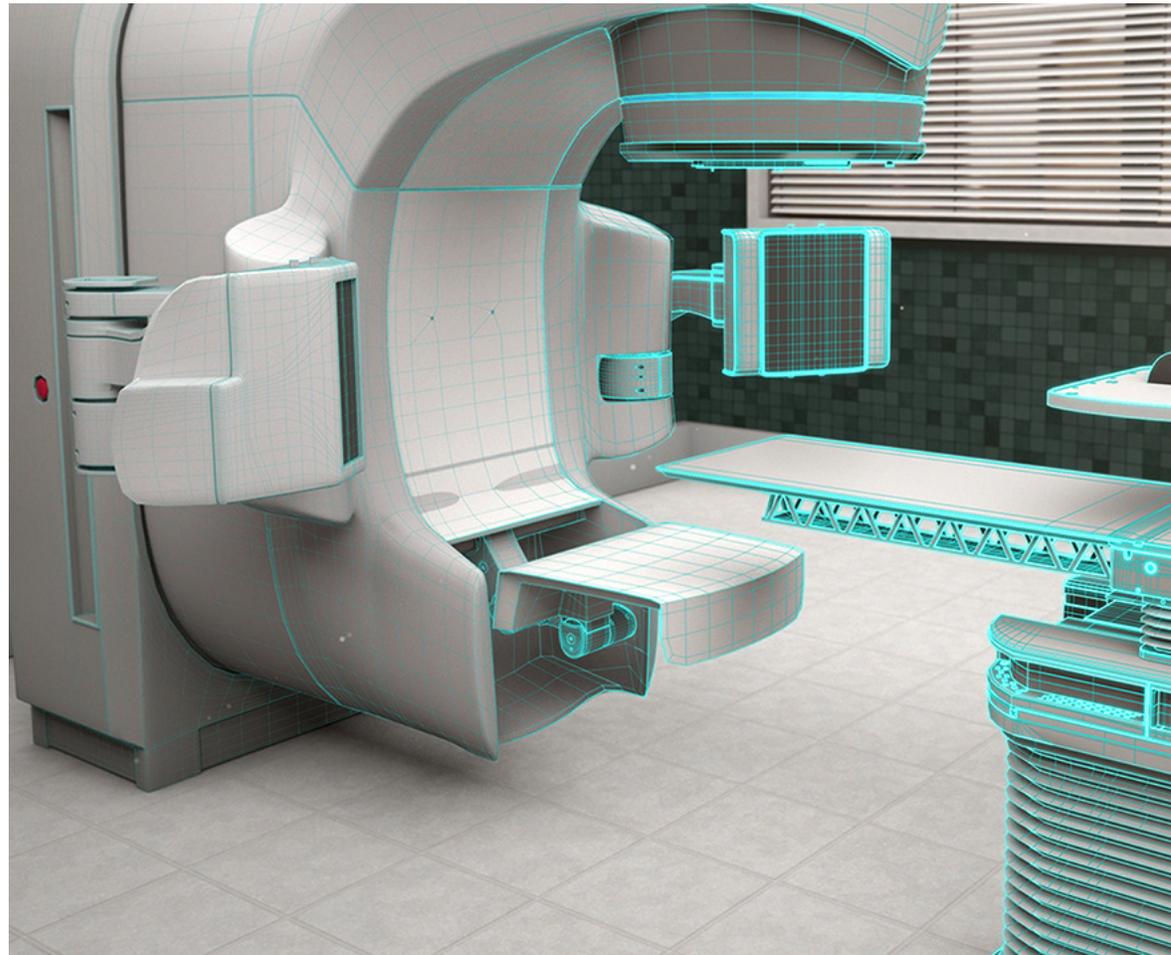
https://community.plm.automation.siemens.com/t5/NX-Design/ct-p/NXforDesign

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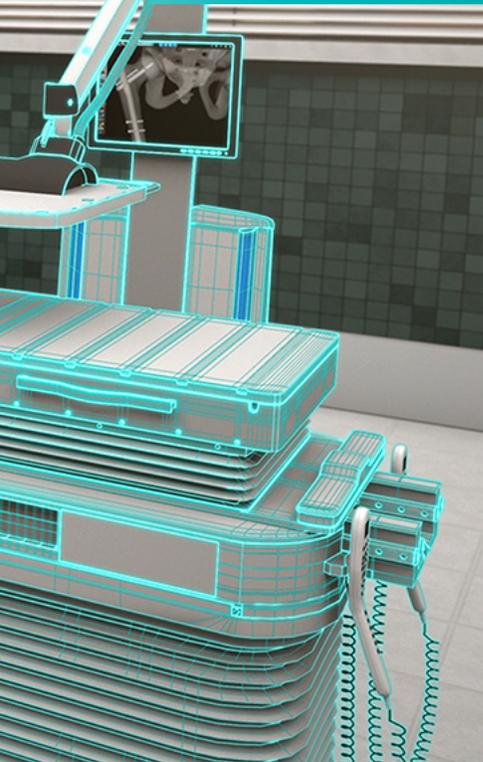
About Siemens Digital Industries Software
Siemens Digital Industries Software is driving
transformation to enable a digital enterprise where
engineering, manufacturing and electronics design meet
tomorrow. Our solutions help companies of all sizes create
and leverage digital twins that provide organizations with
new insights, opportunities and levels of automation to
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