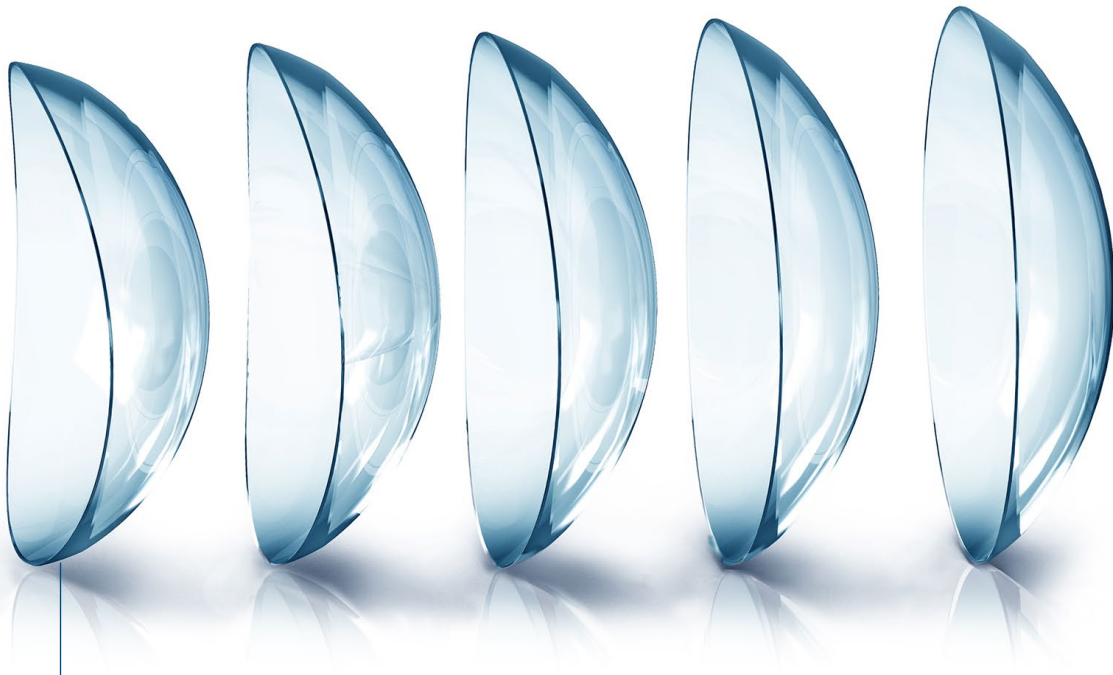


BAUSCH & LOMB

VISUALIZING THE PATH TO INNOVATION IN CONTACT LENS DESIGN WITH SOLIDWORKS SOFTWARE



By standardizing on the SOLIDWORKS 3D design platform, Bausch & Lomb engineers have positioned themselves to achieve innovative breakthroughs in lens performance and wearer comfort.

Challenge:

Automate the design and manufacture of an increasing number of contact lens configurations while driving innovation to develop thinner, more comfortable contact lenses and to elevate the degree of precision of optics and tooling designs.

Solution:

Implement the SOLIDWORKS 3D design platform to leverage SOLIDWORKS surfacing, analysis, and simulation tools and to visualize lens geometries more precisely and completely.

Results:

- Achieved 60 percent reduction in development time
- Reduced number of prototypes by 50 percent
- Improved lens comfort and orientation
- Increased precision in optics and tooling development

One of the most respected healthcare brands in the world, Bausch & Lomb is dedicated to perfecting the vision and enhancing the lives of people around the globe. Since 1853, the company has advanced the state of the art in optics and eye health technologies. Today, Bausch & Lomb continues to lead the development of innovative contact lenses and lens-care products, as well as ophthalmic surgical devices, instruments, and pharmaceuticals.

In 2003, Bausch & Lomb management decided to replace the 2D and 3D CAD tools its engineers had previously used with a standard 3D development platform, according to Robert Stupplebeen, biomechanical engineer. "Dealing with advanced optics, our design tools must be able to handle complex, mathematically precise surfaces and geometries," Stupplebeen explains. "We need to visualize the curvature of our lens surfaces, modulate lens thicknesses, and account for numerous customer-specific design variations for each lens."

By replacing its Unigraphics® and AutoCAD® design applications with a single 3D platform that supports the company's modeling, surfacing, and analysis needs, Bausch & Lomb management believed its engineers could achieve innovative breakthroughs in lens performance and wearer comfort, while automating development processes and controlling costs. The contact lens manufacturer also needed a more user-friendly approach to working with complex surfaces.

Bausch & Lomb chose SOLIDWORKS® Premium software, implementing 30 licenses, because it is easy to use; provides advanced surfacing capabilities; offers design configuration tools; and includes integrated design analysis, simulation, and

workgroup product data management (PDM) applications. "From an engineering standpoint, SOLIDWORKS software is easy to learn and easy to use," Stupplebeen says. "That's why we do all of our design work in SOLIDWORKS."

VISUALIZATION IMPROVES CONTACT LENS COMFORT

Before implementing SOLIDWORKS, Bausch & Lomb engineers could visualize contact lens designs only by building actual prototypes. With SOLIDWORKS, designers can fully examine lens models from all angles, an approach that not only is more efficient and cost-effective but also helps them to make a more comfortable lens.

"We need to make sure that the lenses we produce are perfectly tuned for a wearer's eyelids," Stupplebeen explains. "Visualization and simulation in 3D provide significant benefits in helping us to create the contact lens shape that will flatten and fit the eye precisely, providing the wearer with the greatest degree of comfort."

DRIVING INNOVATION WHILE COMPRESSING DESIGN CYCLES

Using SOLIDWORKS 3D design tools, Bausch & Lomb engineers can adjust the shape of the contact lens with a high degree of precision, which allows them to innovate new materials and control the thickness of the lens, while simultaneously achieving overall reductions in development time of as much as 60 percent. With greater control of the design, Bausch & Lomb engineers no longer need to engage in as many clinical studies to develop lenses that offer better oxygen transmissibility and greater wearer comfort.

"The challenge is to vary the thickness profile to make the lens more comfortable to wear while maintaining the optical properties of the lens," Stupplebeen points out. "If the lens is too thick, it may be uncomfortable to wear. If it's too thin, it may tear too easily or handle poorly (fold or invert). The ability to view lens thicknesses in SOLIDWORKS using Thickness Analysis is very important for enabling us to drive lens comfort and orientation as we work with constantly changing material formulations," Stupplebeen stresses.

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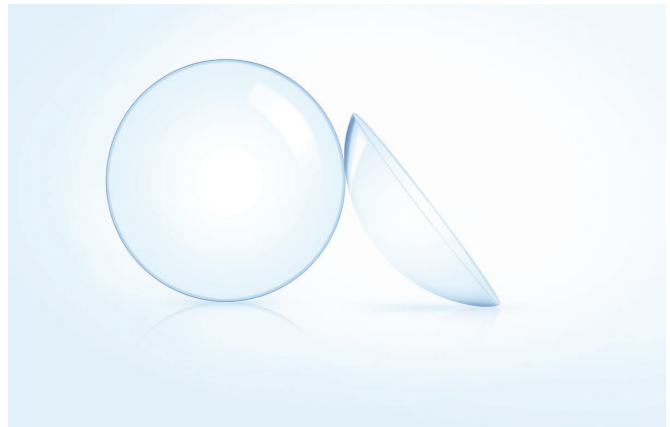
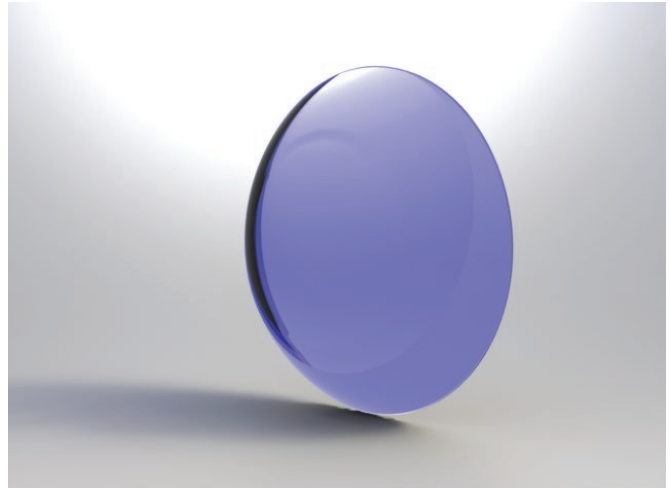
— Robert Stupplebeen, Biomechanical Engineer

CONFIGURING LENS VARIATIONS AUTOMATICALLY

Bausch & Lomb also utilizes SOLIDWORKS design table configuration capabilities to automate the creation of lens design variations, and associated tooling, from a single base design. In addition to contributing to faster design cycles, this capability has helped the company to eliminate 50 percent of the prototypes required, in some instances.

"Each of our lens designs has hundreds of different SKUs to account for variations in prescription, eye size, lens shape, etc., and every individual SKU may have 50 different design parameters, which make it unique," Stupplebeen notes. "Using a design table in SOLIDWORKS, we can develop all of these design variations from the original model, saving time and money in the process."

The company realizes additional savings by applying configurations to the highly precise, single-shot molds and tooling that are required to produce its contact lenses. The company uses one mold for every individual lens and then recycles the mold. Automating this process helps Bausch & Lomb to control manufacturing costs.



In addition to compressing design cycles and reducing prototypes, SOLIDWORKS software gives Bausch & Lomb engineers more precise control of the shape of the contact lens, allowing them to innovate and explore new materials.

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