

# BRUNSWICK BOWLING PRODUCTS

INNOVATING HIGH-PERFORMANCE, ACTION  
BOWLING BALL CORES WITH SOLIDWORKS



Photo Credit: PBA LLC

Brunswick Bowling Products, which manufactures bowling balls favored by professional bowlers like Pro Staff Member Ryan Ciminelli, leveraged SOLIDWORKS 3D design software to develop the innovative bowling ball cores that have advanced bowling ball hooking performance.

**Brunswick**<sup>®</sup>   
Bowling Products

### Challenge:

Advance bowling ball core research to develop performance bowling balls that provide a range of actions to support varying lane conditions.

### Solution:

Implement SOLIDWORKS Standard 3D design software.

### Benefits:

- Innovated greater action performance bowling balls
- Realized ability to map dynamics on bowling ball cores
- Introduced edgier DV8 brand of performance bowling balls
- Developed variety of core designs to match all lane conditions

The name Brunswick is synonymous with bowling. Not only did John Moses Brunswick found the company that took bowling out of fancy Victorian parlors and into the public arena, his son-in-law, Moses Bensing, standardized the rules for the game and organized the first American Bowling Congress (ABC) in 1895, which held the first significant bowling tournament in 1902. The ABC (now the United States Bowling Congress, USBC) has become a prominent fixture in competitive, professional bowling, and is responsible for developing the professional game and global appeal that the sport enjoys today.

While Brunswick Bowling Products designs and manufactures everything required to build, maintain, and operate a bowling center, the company's Consumer Products Group focuses on products for individual bowlers, including bowling balls, bags, shoes, and accessories. Until 2001, the company used AutoCAD® 2D and Mechanical Desktop® design tools to develop its products. But they needed a more intuitive 3D design platform to run the mass properties calculations, cavity parts out of assemblies, and provide the design visualization necessary to advance bowling ball core research and development, according to R&D Core Engineer Aaron Koch.

"I design cores for Brunswick bowling balls, which are a part of the ball that influences the performance hook on which today's bowlers rely," Koch explains. "Over the last decade, we've introduced a range of innovations in ball core design for which 3D design played an important role. I joined the company after the decision was made to standardize on SOLIDWORKS® Standard 3D design software in 2001, but I've benefited greatly from the move because SOLIDWORKS is the tool that helps me achieve our R&D and product development goals."

Brunswick Bowling Products evaluated the SOLIDWORKS and Pro/ENGINEER® 3D design packages before choosing SOLIDWORKS software because it was easier to use, offered a more intuitive workflow, and made getting up to speed and performing tasks faster. "My background is in bowling and physics, and SOLIDWORKS is the only CAD software that I've used," Koch notes. "In addition to helping me do my job, I enjoy working in SOLIDWORKS immensely."

### THE HOOK: RADIUS OF GYRATION MEETS MOMENT OF INERTIA

Brunswick leveraged SOLIDWORKS software to develop the innovative bowling ball cores that have advanced bowling ball hooking performance. Using SOLIDWORKS, Brunswick can accurately model and control ball dynamics to produce designs that hook sooner or later on a lane, or perform better on oily, dry, or mixed lanes.

"The hook spot, the point on the lane where the ball changes direction, is greatly influenced by the ball's moment of inertia," Koch explains. "We can control when and how much the ball will hook by varying the density of the materials used in a ball's inner and outer core, and by altering the shape and mass of the inner core to increase or decrease the radius of gyration (RG), as well as the differential between the maximum and minimum RG. With SOLIDWORKS, I can clearly visualize the core design and use mass properties to maintain the integrity of design dynamics while changing the densities of the inner and outer cores to achieve the desired performance."



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— Aaron Koch, R&D Core Engineer

### DYNAMIC TOPO MAP FOR BOWLING BALL CORES

As Brunswick continued to utilize SOLIDWORKS, Koch took advantage of the software's automation flexibility to develop a macro that applies RG contours to bowling ball core designs in a manner similar to topographical maps. "Instead of lines showing differences in elevation, SOLIDWORKS lets me create contours that show variations in the RG," Koch explains.

"The macro uses SOLIDWORKS mass properties to measure the RG at different planes and fixed points and a coordinate system to apply lines similar to longitude and latitude. The macro then maps RG levels by contours," Koch continues. "With these RG contours, I can gauge how the axis of rotation will migrate on a design, which is extremely beneficial when designing more sophisticated, performance bowling balls."

**Focus on Brunswick Bowling Products**  
VAR: Fisher/Unitech, Grand Rapids, MI, USA

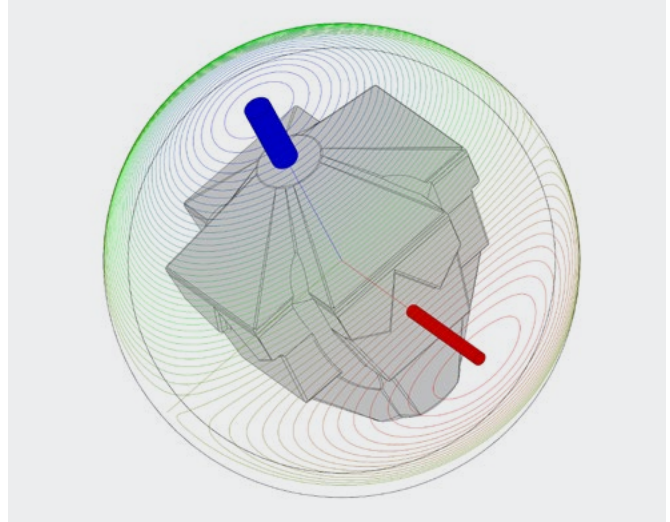
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### CORE ADAPTATIONS SPAWN DV8

With SOLIDWORKS, Brunswick developed ball cores that extended the range of performance variations in Brunswick bowling balls, and created and introduced an entirely new line of bowling balls under the DV8 brand. With model names like Deviant, Ruckus, and Zombie, the DV8 targets a younger audience with brighter colors, an edgier look, and more active performance.

"On DV8 cores, we've created high-performance hooking balls that have more identifiable cores—some with more angular shapes and others with recognizable characteristics like a skull," Koch says. "Using SOLIDWORKS, we can quickly develop cores to achieve new levels of performance, and then use PhotoView 360 to produce ball core cutaways for marketing materials for both Brunswick and DV8 bowling balls."



Using the automation flexibility of SOLIDWORKS design software, Brunswick Bowling Products was able to plot radius of gyration (RG) contours on the inner core of its bowling ball designs. This proved to be extremely beneficial for extending the range of performance variations in Brunswick bowling balls through its DV8 brand, including the Nightmare inner ball core shown here.

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