CASE STUDY

DESIGN WITHOUT LIMITS

ALTAIR® HYPERWORKS® DRIVES INNOVATION IN CLEVELAND GOLF'S HIBORE XL DRIVER

About the Customer

Cleveland Golf, a global leader in golf club design and manufacturing, has earned a reputation for creating high-performance wedges and easy-to-hit woods and irons that elevate players' games and help professional and recreational golfers alike shoot their lowest scores. Part of the SRI Sports Limited family, Cleveland Golf operates across multiple international locations, supplying cutting-edge products to golfers worldwide. Its dedication to innovation has helped golfers of all levels achieve their personal bests, solidifying the brand's position as a trusted name in the sports equipment industry for more than 45 years.

Cleveland Golf's latest generation of the HiBore XL driver builds on its legacy as a club that pushes the limits of driver design and performance. Born from a bold vision, this new iteration of the HiBore XL aims to break free from traditional driver geometry. To bring this radically new concept to market—exploring thousands of potential designs and optimizing shape for a multitude of interdependent design variables—Cleveland Golf needed a partner with the right tools and expertise.

Their Challenge

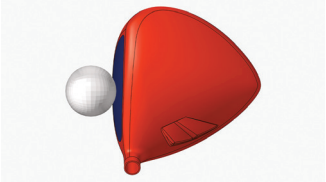
Cleveland Golf hypothesized that by breaking free from the traditional bounds of driver shape design they could achieve a new level of performance. The new HiBore XL needed to stay within the confines of United States Golf Association (USGA) regulations while offering game improvement players max forgiveness, lots of power, and unmatched sound quality. To do this, the driver needed a large, forgiving clubface, stiff body structure, and optimized weight distribution. The challenge was managing all the complex, interconnected design variables: face size, internal ribs and weighting, mass, center of gravity, moment of inertia (MOI), volume, stiffness, and more. All had to be monitored to assess forgiveness, sound, and USGA compliance.

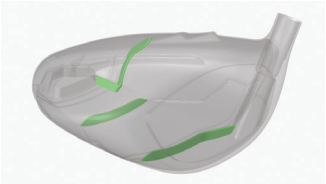
5 ▼
GRAM WEIGHT SAVINGS

24% ▼
RELATIVE REDUCTION IN BALLS IMPACTED PARTIALLY OF THE FACE

20% ▲
INCREASE IN PRIMARY VIBRATION FREQUENCY

To realize their ambitious vision for the HiBore XL, the Cleveland Golf team knew they needed to push their technological capabilities beyond what's possible with mere off-the-shelf tools. They knew design and engineering would have been slow and difficult using traditional CAE methods or physical prototyping. Cleveland Golf needed software that combined accuracy, efficiency, and versatility. "We rely on FEA tools alongside automation and optimization to accomplish big things with a small team," said Jacob Lambeth, research engineering supervisor, Cleveland Golf. "For the HiBore XL project, we knew the ability to customize and integrate multiple tools within a single, cohesive workflow was critical."





TOP: HiBore XL driver head breaks away from traditional geometry, exploring thousands of designs and optimizing shape.
MIDDLE: Custom ribbing optimization process enhances HiBore XL driver's sound quality, MOI, and forgiveness.
BOTTOM: The HiBore XL driver features a 19% larger face, enhancing forgiveness.

Our Solution

To bring the new HiBore XL to life, Cleveland Golf collaborated with Altair and utilized the Altair® HyperWorks® platform, a comprehensive suite of advanced design and simulation tools built on an open architecture. This collaboration gave the Cleveland Golf team the freedom, flexibility, and expertise it needed to explore the design space and develop a unique, boundary-breaking driver. It also helped Cleveland Golf move beyond the slow, costly process of modeling one design at a time, allowing them to leverage optimization to direct big and small design decisions simultaneously and ultimately engineer a unique driver with optimized geometry, weight distribution, and performance.

To create the HiBore XL, the Cleveland Golf team used an array of tools within the Altair® HyperWorks® platform. To start, they utilized meshing and modal analysis in Altair® Inspire™, followed by shape refinement using the morphing capabilities of Altair® HyperMesh®. From there, they used Altair® MotionSolve® to tune the clubface's angle at address and conducted free-size, shape, and topology optimization in Altair® OptiStruct® to meet performance targets. The driver face, featuring variable thickness, was optimized using automated impact simulations in Altair® HyperStudy® and Altair® Radioss®. Finally, they post-processed the results in Altair® Compose® to ensure optimal durability and ball speed.

Another significant leap came from a direct collaboration between the experts at Cleveland Golf and Altair. Together, they co-created a custom ribbing optimization process centered around OptiStruct. This process gave the Cleveland Golf team the ability to find rib configurations that increased stiffness while saving weight. The increased stiffness improved the club's sound, while the weight savings allowed the team to reposition the club's mass to improve its center of gravity and MOI. They also used HyperStudy to explore various design trade-offs and connect OptiStruct with other tools, further optimizing the design.

Additionally, beyond the tools themselves, Cleveland Golf benefited from the Altair Units licensing system. Altair Units empowered Cleveland Golf with flexible access to an extensive software toolkit, enabling broad exploration of design possibilities without needing to worry about traditional cost constraints. This value-driven approach maximized Cleveland Golf's ROI, empowering their team to explore more designs, and freeing them from worry about excessive costs.

Results

Supported by the Altair HyperWorks platform, Cleveland Golf seamlessly transitioned between various Altair tools, techniques, and optimization processes throughout the product development life cycle, customizing workflows and integrating them with both in-house and third-party solutions. This adaptability enabled the team to use the right tools at the right time and adjust their approach as the HiBore XL's design evolved. "We pushed our technology to new heights, transforming it from a simple tool into a catalyst for innovation," said Dustin Brekke, director of engineering, Cleveland Golf.

Through Altair's tools and collaboration with its experts, Cleveland Golf redistributed 5-gram weight savings from the ribs and improved the HiBore XL's MOI, forgiveness, sound, and feel. Compared to its predecessor, the Launcher XL2, the team increased the HiBore XL's primary vibration frequency (first mode frequency) by 20% and face size by 19%. Most importantly, the HiBore XL demonstrated sizable performance gains in terms of forgiveness, including a 24% relative reduction in balls impacted partially off the face of the club. By leveraging Altair's advanced technology, Cleveland Golf improved the HiBore XL's performance and was able to confidently explore bold new design possibilities without compromising delivery schedules.

With the HiBore XL, we sought to equip players with a driver unbound by the traditional limits of shaping, delivering exciting new performance accomplishments. Altair empowered us with the technology to do just that. We pride ourselves on being at the cutting edge, and today, that means embracing the market's premier simulation and design software.

Collaborating with Altair helps us innovate in brand-new ways and maintain our reputation for pushing the limits of club design.

Jacob Lambeth, Research Engineering Supervisor, Cleveland Golf

Thus, the latest HiBore XL driver was born: a product that shows how Cleveland Golf, by pushing the boundaries of technology, is reshaping what's possible in golf club design. More than just a driver, the HiBore XL represents the power of collaborating with an industry-leading technology partner like Altair. "This partnership helped us transform off-the-shelf technology into a tool for rapid exploration, innovation, and creativity, achieving solutions that go beyond standard innovation systems," Brekke said. By combining Cleveland Golf's vision with Altair's technology, domain expertise, and flexible licensing model, the Cleveland Golf team engineered a driver that delivered on their vision and created a club that's shaping the future of golf, one swing at a time.

To learn more, please visit altair.com/altair-hyperworks