



# ***HCL***

## **Building custom guitars** from sustainable materials cost-effectively

Born custom guitars automates custom  
electric guitar development using



Jonathan “Jay” Miller founded Born Custom Guitars, a Colorado-based electric guitar company, with the goal of designing and building custom, unique guitars that fit the tastes and preferences of each individual player. Miller’s passion for music and for building beautiful, eminently playable stringed instruments prompted him to leave a career in the financial services industry and establish Born Custom Guitars in 2010.

A guitarist himself, Miller strongly believes that playing a guitar that is tailored to each individual player can make a tremendous difference in a musician’s playing ability, musical output, and development. His belief in designing and crafting a specialized guitar for each player—instead of building one-model-fits-all guitars—and producing guitars in a sustainable, environmentally conscious manner were the inspirations that led him to found a company to build exceptional guitars and accessories. Building on his two business degrees, including an MBA in sustainable business from the University of Colorado Boulder, and growing up around his father’s woodshop, Jay began to research the best production solutions to allow for high levels of customization and quality.



*Guitars from Born Custom Guitars are designed and built to match the unique style and preferences of each customer – from the wood selection to the control layout to the design components and more.*

“I took my business skill set and decided to do something that I was passionate about,” Miller recalls. “Our primary focus is sustainability and quality. Those two goals take priority over everything else, but we still need to be efficient and control costs to succeed as a business. That’s where CAMWorks® milling software comes in. I already knew a lot about wood-working and guitars, and my business background made me realize that if I could learn and leverage CNC technology to automate some aspects of the guitar-crafting process, I could save time and money, realize consistent quality, and allow sufficient time for the details that are so critical when crafting a special, one-of-a-kind instrument.”

*Born Custom Guitars uses high-quality, sustainably-sourced wood for every guitar.*





Miller is so focused on the details for each instrument that he hand-selects individual pieces of wood for every customer, instead of the next one in the stack, for every guitar that he builds. In order to allow for the detailed craftsmanship that has made Born successful, he needed an automated method for customizing guitar necks and bodies to each customer's exacting specifications. Fortunately, he had struck up a friendship with Michael Buchli, a local SOLIDWORKS® and CAMWorks power user, who stopped by Miller's shop weekly in the beginning to help him out.



**Jonathan Miller,**  
owner and luthier of Born Custom Guitars.

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I really liked the idea of how SOLIDWORKS design software and CAMWorks machining software are integrated and work in unison,” Miller explains. “CAMWorks Milling Professional software was easy to learn and is the best solution for running my machine—3-axis milling on a 4 x 8-foot CNC router table—to make sexy, flowing curves and modify the geometry on every guitar. I also value the knowledge-based machining database, which learns and replicates common tooling operations. I’ve found SOLIDWORKS and CAMWorks to be really fantastic and flexible solutions for what we do.

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## THE CLIENT

Company: Born Custom Guitars, LLC

Headquarters: Longmont, CO, USA

Industry: Musical instruments  
from sustainable materials with an  
emphasis on electric guitars

## THE OBJECTIVE

Launch a custom electric guitar manufacturing and luthier business by automating the production of guitar bodies and necks to improve productivity, increase accuracy, and eliminate unnecessary costs and delays, while building the company into an industry leader in sustainable manufacturing through the creation of heirloom-quality electric guitars.

## THE SOLUTION

Implement CAMWorks Milling Professional software to take advantage of the solution's seamless integration with SOLIDWORKS 3D modeling software, feature-based recognition capabilities, and extensive knowledge database.

## THE BENEFITS

Reduced guitar body and neck blank cutting labor time by 90 percent and overall time by 80 percent

Saved time and money - several hours in labor cost per guitar - through automation efficiencies and rapid prototype capabilities

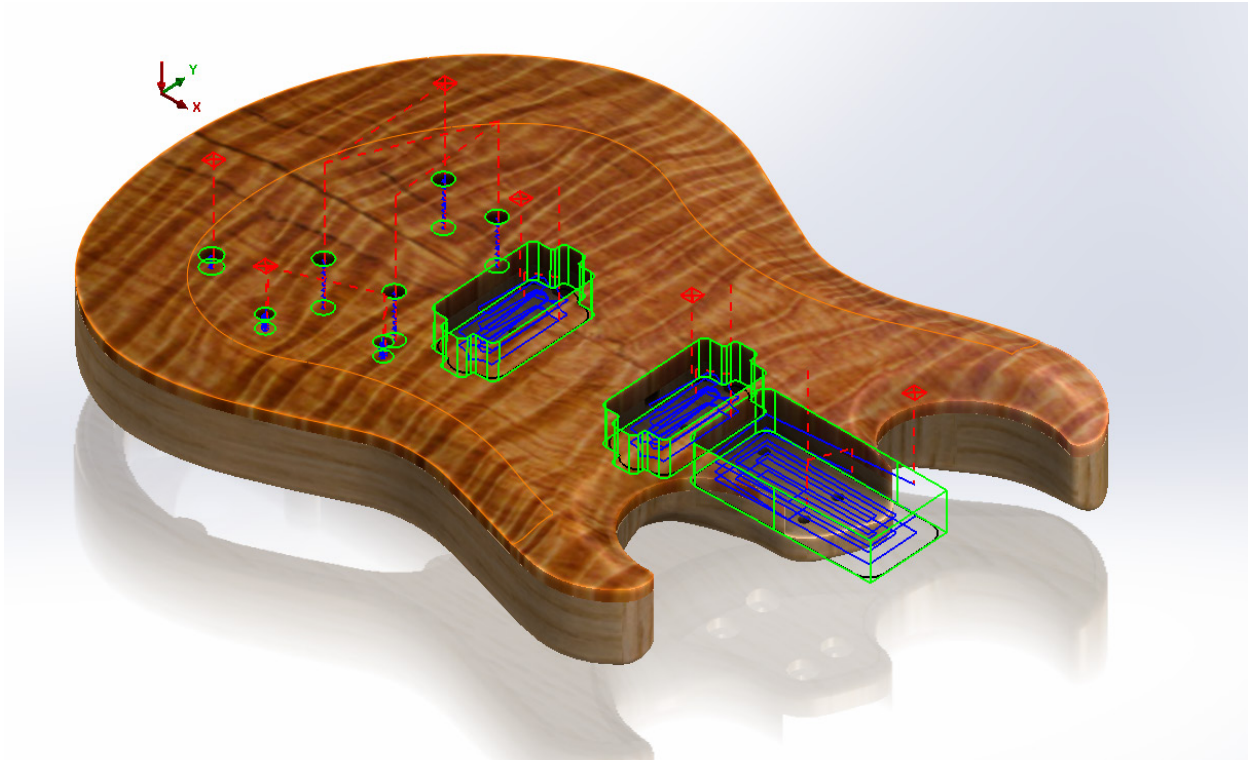
Supported higher attention to instrument details and craftsmanship due to automation

Realized more efficient material usage with organic/non-uniform materials

## Learning on the Job

With no engineering background, Miller worked with Buchli once a week and studied SOLIDWORKS and CAMWorks at night after work. "I was able to machine high-quality guitar parts very quickly, and I've continued to improve our process ever since. Our operational feedback loop allows us to increase efficiencies and improve quality in real time," Miller explains. "I'm always learning and refining, which is a fundamental part of my process. My abilities have improved incrementally since the beginning, and new CAMWorks machining methods have improved our tool paths significantly, improving cut times and tool life."

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*Knowledge-based machining and automation technology in CAMWorks allows Born Custom Guitars to increase their production and accelerate the fulfillment of their customers' guitar orders.*

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I've always been a hands-on learner, and CAMWorks was so intuitive that I was able to pick it up quickly," Miller adds. "At first, I'd run simulations and test runs, but I don't have to do that much anymore unless I'm making major changes in machining methods or developing entirely new designs. Once you understand your machine and how it reads code, it is very easy to make adjustments within CAMworks so that your programs run perfect the first time, everytime. The most important thing I've learned is maintenance. Keep your tools sharp and your machine oiled and clean. My goal as a luthier is to make the best possible guitar available on the market for your money. The skills that I've learned working with CAMWorks are helping me achieve that goal on every guitar that I make."

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## Saving Time and Money

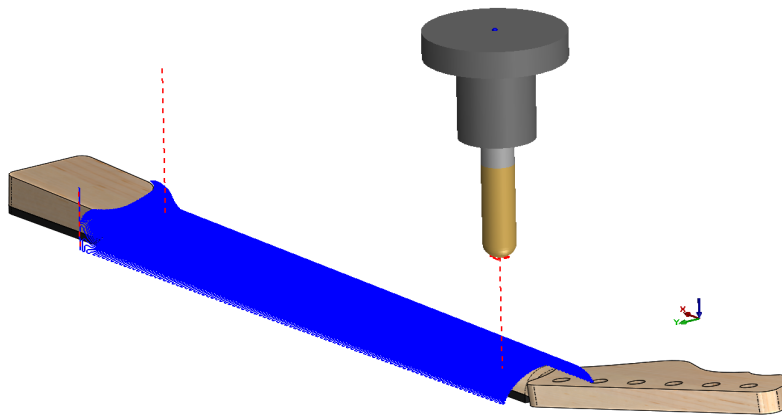
Although Born Custom Guitars incurred upfront costs in obtaining the software and equipment to mill guitar bodies and necks from wood, Miller has seen substantial return on his initial investment in CAMWorks Milling Professional software. “With the efficiencies that we’ve been able to realize using CAMWorks, the software has paid for itself many times over and is helping us recoup other capital costs as well,” Miller stresses.

“CAMWorks is definitely among the leaders in CAM technology. I’m not just saying that because I was able to learn how to use the software to drive my business. I also see the value in their knowledge-based approach to machining,” Miller continues. “We currently have a database stretching back seven years that documents how we like to cut things. That’s a big deal, especially when we want to make a design change.

“Previously, it would take me a full day to carve a body or neck from a piece of wood. With CAMWorks, I hit ‘start’ and go do something else. With the CAMWorks tooling program and my CNC router, I can complete a fretboard, fully shaped, slotted, and routed for a custom inlay, in about 30 minutes,” Miller notes. “CAMWorks virtual toolpaths allow me to evaluate my machining files before they are ever used on the shop floor. With the level of automation that Born’s realized with CAMWorks software, we are saving a bunch of time—a 90-percent reduction in labor time and an 80-percent reduction in time overall—and money, which allows me to focus on the detailed design features that make every guitar unique, such as custom inlays, custom finishes, and customer-centric modifications.”

## Greater Attention to Details

Because of the automation and efficiency that Born has realized in milling guitar bodies and necks with CAMWorks, the company has reduced the amount of hand-sanding required for each guitar and provided Miller with the time and focus he needs to match the guitar design to the individual customer. “The details are everything in creating a guitar that fits the player,” Miller explains. “What kind of player are they: jazz, funk, rock, or metal? What vibe are they seeking? What’s the player’s hand size and playing style? Should we use a solid or semi-hollow body? What type of wood should we use for the body and the neck? What layout should we use on the fret board? What is the tap tone of these woods, and how will they sound together?



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*Born Custom Guitars uses SOLIDWORKS and CAMWorks to design and mill the guitar bodies and necks for their custom guitars.*

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The answers to questions like these drive the artistic side of the luthier,” Miller adds. “In essence, CAMWorks and milling technology help me to be more artful because they automate the heavy labor of shaping and sanding bodies and necks, as well as the attention to detail required for completing those tasks by hand. This allows me to spend the extra time to add the artistic touches that make a guitar special, such as finishing the neck by hand for feel or finalizing our deluxe fretwork. Many of my customers say that their Born Guitar is the best instrument that they’ve ever owned. That means we’re doing our job, and CAMWorks is helping to make it possible.

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## About CAMWorks

2020 © HCL Technologies. All rights reserved. CAMWorks is the next generation best-in-class CNC programming solution that enables users to program smarter and machine faster was originally introduced in 1997. This state-of-the-art solids CAM product is designed for product-oriented manufacturing companies, and is available for machining centers, turning, mill/turn, and wire EDM applications. CAMWorks® with Machining Intelligence is the most advanced CAM programming software available for getting products to market faster, more efficiently, and within budget.

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