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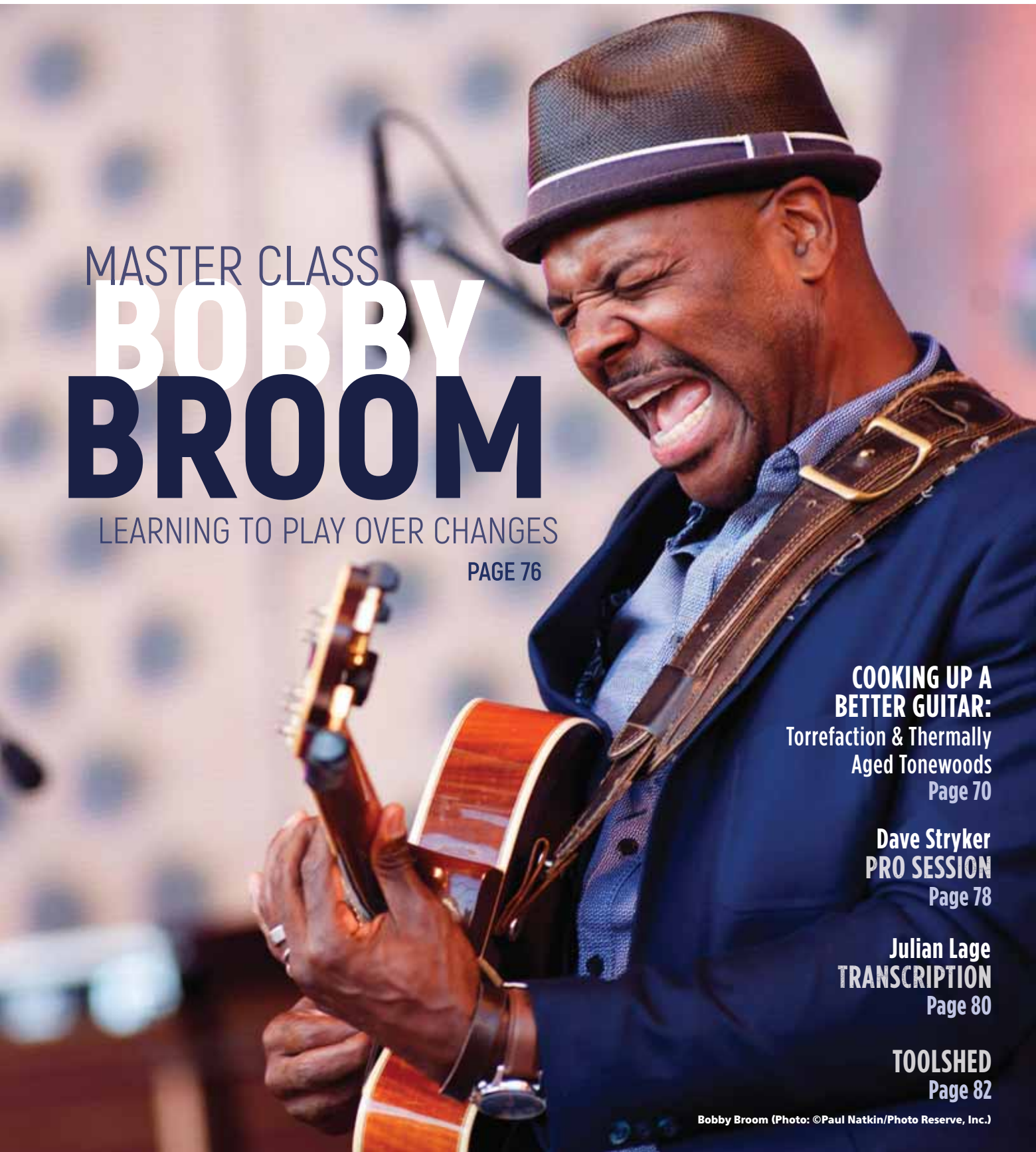

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Bobby Broom (Photo: ©Paul Natkin/Photo Reserve, Inc.)

By Keith Baumann

COOKING UP A BETTER GUITAR

The Benefits of Torrefaction & Thermally Aged Woods

There is an old joke that goes, "How many guitarists does it take to screw in a lightbulb?" The punchline is, "One thousand: one to screw in the lightbulb and 999 to talk about how much better the old bulb was."

The sentiment expressed in this bit of humor is very real, and we all can agree that there is something special about a well-seasoned instrument. Natural aging of the wood and playing time are important factors in the maturing of musical instruments, and luthiers have spent decades researching this phenomenon in the hopes of discovering a method to accelerate the process. Although improvements in materials, design and manufacturing have resulted in instruments that edge closer to that highly coveted sound, a technique known as *torrefaction* rapidly has been gaining acceptance as one of the more significant advancements in this quest, and it has seriously grabbed the attention of the entire guitar world.

Torrefaction was created with an entirely different purpose in mind. With roots that stem from the time of the Vikings, the modern technique is credited to a Finnish fire chief named Osmo Savolainen, who was searching for a non-toxic alternative to pressure treating, a chemical process used to make wood resistant to rotting and warping in outdoor environments. He hoped to use it in the construction of children's playgrounds. This research led to the development of the "thermal treatment" process in the late 1980s, which uses high heat in an oxygen-deprived container to dry out wood, resulting in a more stable and weather-resistant material. Years later, Savolainen happened to show some of his treated material to a friend, Rauno Nieminen, headmaster of a guitar-making school in Finland, who immediately noticed

a similarity between this wood and images he had seen of a 17th century violin top.

Nieminen's discovery led to an intensive university study intended to evaluate the effects of thermal treated wood used on musical instruments. The study, released in 1999, produced data that clearly indicated that this process replicated some of the same chemical reactions that occur in the natural aging of tonewoods. It also indicated that the wood underwent a measurable improvement in its ability to transfer vibrations across its surface. Available only in the Finnish language, the report did not gain much attention at first. Some eight years later, an article on the process by David Wilson appeared in the "ToneQuest Report," and torrefaction began to gain serious traction.

Today, torrefaction increasingly is used by guitar makers worldwide in building both acoustics and electrics. Many of these builders point out that torrefaction has the ability to noticeably improve the tonal characteristics of a new instrument, and it also adds dimensional stability to the wood. With such a major innovation impacting the industry, we decided to take a closer look at the process and speak with several companies that currently use torrefied wood in building their guitars.

As a participant in the initial Finnish study in 1998, Juha Ruokangas, master guitar builder and CEO at Ruokangas Guitars, is one of the very first luthiers to use torrefied wood on guitars. He is widely recognized as a pioneer in the field. Ruokangas was given the opportunity to measure and inspect pre- and post-treated wood and came to the conclusion that certain types of thermal treatment can result in a chemical reaction that is nearly identical to what occurs during natural aging. To be more specific, cell walls harden, resins crystalize and partially vaporize, stiffness is increased, weight is slightly reduced, the wood darkens in color and pores are cleansed.

Ruokangas' first instruments to use torrefied woods were solidbody electrics that had treated necks, bodies and fretboards. He noticed a difference in the stability of the material, as well as an increase in strength, and these two benefits alone were enough to sell him on the process. Actually, the added stability was the first aspect that widely was acknowledged by the music industry, resulting in several companies offering "roasted" necks for electric instruments.

The tonal benefits of torrefaction took a bit longer to surface, and Ruokangas points out that they are more subjective. He noticed that many players of his customers were sensing a difference in the sound of these treated necks, commenting that they were "just better." Ruokangas also said that during the study, experimentation with a variety of temperatures and durations indicated that extreme treatments can result in negative consequences, such as overly brittle wood, and that milder treatments produce the best results for instruments. Ruokangas has gone on to build carved archtops using treated wood and is a firm believer in torrefaction. "It is just good for the whole industry," he says.

Ruokangas' research had opened a door, and Dana Bourgeois, founder and CEO of Bourgeois Guitars, was one of the first ones to step through it. Bourgeois widely is recognized as a trailblazer who has had a major impact on the use of torrefaction in acoustic guitars. His interest in torrefaction began when he first saw a thermo-treated bass guitar neck from Music Man. In addition to enhanced stability, Bourgeois noticed that this wood differed in appearance and began to hear that it also sounded better. He soon acquired some samples of Adirondack spruce and immediately sensed a similarity to aged wood. During a conversation with a violin-making friend, Bourgeois was asked to shine a light through

Recording King RP1-16C

Martin D-28 Authentic 1937

the wood to see if it would pass through. It did not, and he learned that this was one of the foolproof methods used to detect counterfeit Stradivarius violins, since new wood allows light to pass through but old wood does not. With his interest piqued, Bourgeois built his first guitar using a torrefied top in 2012. "It was amazing," he says. "I immediately acquired all the treated wood I could."

Bourgeois now uses treated wood in more than half the guitars he builds, and torrefied tops are available as an option on any model. He has developed a process called "Aged Tone," which uses treated tops and braces plus a specially developed finish that mimics the thinness and hardness of aged nitro-cellulous lacquer. Bourgeois points out that it took years of experimentation trying various species of wood and altering time and temperature to come up with the best "recipe" for his particular needs."Torrefaction has affected the way we build," he says. "We had to learn how to optimize." In describing the tone of these guitars, Bourgeois points out that they tend to be very lively, with a quicker response, and sound more like a broken-in guitar."This is probably one of the most important technological advances I've seen in decades of guitar making," he says.

As the largest purchaser of wood in the music industry, it only makes sense that Yamaha would take an interest in torrefaction. According to Dennis Webster, marketing manager at Yamaha Guitars, initial research on the technology began in the violin department but soon spread to acoustic guitars, which were the first products released in 2007 using the technique. Yamaha offers torrefied tops on their L series and A series models cooked to the company's own custom recipe, known as Acoustic Resonance Enhancement. Webster says that Yamaha actually built its own proprietary ovens and doesn't depend on any outsourcing. This has allowed Yamaha to maintain total control over the process and fine-tune it to perfection. In evaluating the effects of torrefaction, Yamaha ran A/B tests comparing treated guitars to non-treated. The difference was not only audible; scientific measurements indicated a substantial increase in the resonance of the wood. The result is a more balanced guitar with sweetened highs and better lows. Webster adds, "We are giving the guitar a 10- to 15-year head start." Yamaha also notes that the A.R.E. process adds time and expense to the build, but it's well worth it, considering the final result.

Eastman Music Company began looking into torrefaction about two years ago, running tests on Adirondack spruce tops. The company released select models with "ThemoCured" tops last year, with only about 40 instruments produced. According to Otto D'Ambrosio, guitar designer at Eastman, the company fully is convinced of the benefits of the process, but remains in the evaluation phase as it tweaks its manufacturing techniques. D'Ambrosio says that torrefaction simply is an additional step in building guitars and that it is by no means a substitute for "good wood and good work." He

Ruokangas Emma Maria

Ibanez AVD9MH

adds, "There are very few individual steps that you can change in the process that will have such a large impact." D'Ambrosio describes playing Eastman's ThermoCured guitars as "a night-and-day experience," adding that "it rounds all the corners."

Like many others, Don MacRostie, luthier at Red Diamond Mandolins, first heard about torrefaction from Bourgeois. However, he took a different approach, applying the technique to his carved-top mandolins, instead of flattop acoustic guitars. Carved instruments are very different animals, and the archtop community has been extremely slow in adopting torrefaction. MacRostie felt that the technique would work well for his instruments, and after sending some samples out for testing, he decided that commercially treated wood was too brittle for his use and went on to build his own oven, so he could experiment and develop the perfect recipe for his purposes. He found that a "light cook" worked best for him and has since jumped in with both feet, using treated wood on nearly every instrument he builds. In addition to the tops, MacRostie also cooks the backs and sides, necks, tonebars, neck blocks and even bridges.

MacRostie noticed that when given the choice between a treated and un-treated instrument, players preferred the torrefied mandolin nearly every time. Torrefied wood also is stiffer and less sensitive to climate change, making it easier to carve, sand and finish. MacRostie feels that his main goal is to see how close a modern maker can come to producing an instrument that plays and sound like a Lloyd Loar; he's confident that torrefaction will help him achieve this. "There is no one thing that will make or break an instrument," he concludes. "All the little things together can make a big difference. And torrefaction is definitely one of those things that makes a difference. The acoustic quality becomes mellow and sweeter, and all the frequencies sound more compressed. It's like all the corners are rounded."

Jonathan Lee, director of design and development at Washburn Guitars, has been aware of torrefaction since the Finnish report was published in the late 1990s. The company had been conducting experiments with other roasting methods prior to releasing its first torrefied guitars a few years ago. According to Lee, Washburn was very interested in trying the technique on mass-market instruments. They have had success with spruce and mahogany, but found that cedar was problematic. Today, Washburn uses torrefied tops on nearly all of its solid wood guitars built overseas. Tops and braces are treated, and varying degrees of treatment are used on different models. With instruments shipping worldwide, the dimensional stability of torrefied guitars is a huge benefit to Washburn. Lee also mentions, "There is an immediacy that occurs with the tone on these instruments, and they appear a bit louder." He says that there is an increased cost and extra risk involved in torrefaction, since the wood is a bit more finicky and it requires an added amount of awareness in manufacturing. Lee adds that torrefaction is not magic: It still requires quality tonewood to produce a good guitar.

As a company focused on providing quality, affordable instruments, Recording King was extremely interested in exploring the benefits of torrefaction. According to Travis Atz, director of product development for parent company The Music Link, it was Bourgeois' work that convinced him that the process was not just voodoo. Recording King built a few prototypes and offered its first torrefied-top guitars in 2014. Atz says that there was a serious learning curve involved in working with treated wood, as it reacts differently to tools and adhesives. Recording King has developed its own custom recipe and feels that these instruments exhibit an even response with more volume and increased bass. Atz feels that torrefaction works extremely well for Recording King's market. "We are proud to have been one of the first to offer it in a low-priced instrument," he says. Atz notes that these guitars will age just like vintage

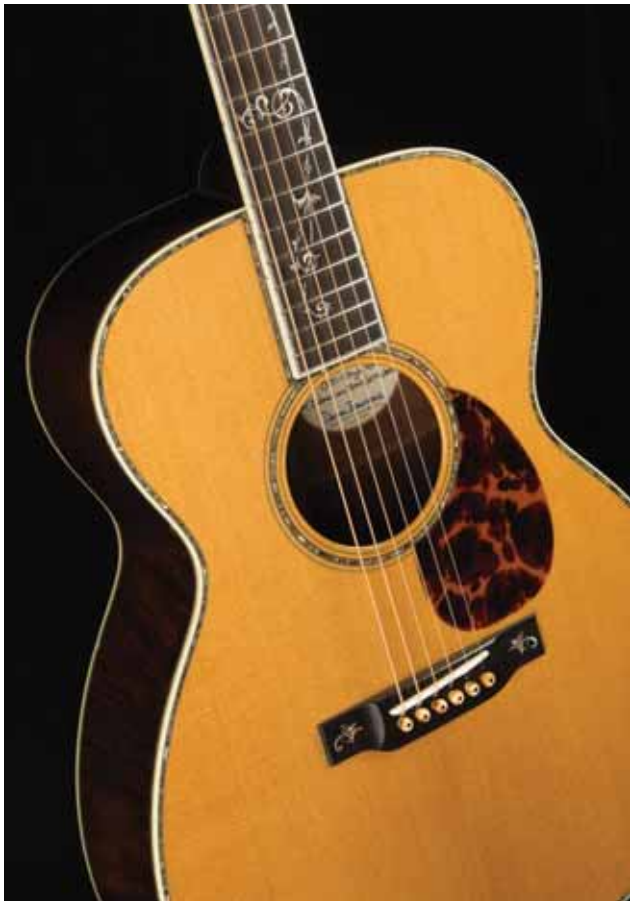
instruments and that torrefaction simply is speeding up the natural changes that occur in the wood over time.

Taylor Guitars had been experimenting with torrefaction for years and has taken a gradual approach, introducing the process on a few select models in 2016. According to Andy Powers, master guitar designer at Taylor, the company closely is evaluating the effects of the treatment on various guitars and wood species to ensure that it benefits the overall sound of the instrument. Powers points out that the added resonance and decreased damping sometimes can have a negative impact on a guitar by introducing unwanted overtones and other inharmonic content."You have to be very careful," he says. "It can create something that is non-musical."

Taylor has worked with spruce, koa, maple, mahogany and rosewood, using a slightly different recipe for each wood. According to Powers, the results of torrefaction are lighter and stiffer wood with a lower damping factor and higher sound velocity, noting an increase of 5 to 10 percent. Taylor feels that it's essential to maintain total control over the process and has its own thermal oven on site. The company uses a mild treatment and actually introduces some oxygen into its recipe. Powers states that the results vary quite a bit with different times and temperatures, and he claims that Taylor's unique recipe produces results closer to natural aging.

Powers recognizes the potential of torrefaction and says it gives an instrument a head start. "You can get some of the characteristics of an old guitar, but it is not a substitute for natural aging," he says.

Ibanez claims that torrefaction first came onto its radar when major players like Martin and Taylor began to use the process. Ibanez felt it would be perfect for its Artwood Vintage line, which features moderately priced guitars built to vintage specs. Ibanez released the Artwood Vintage Thermo Aged series instruments



Bourgeois Aged Tone OM-45

in 2013. Frank Facciolo, acoustic guitar merchandiser for Hoshino, says that Ibanez was "looking to capture that vintage look and sound at an affordable price, and Thermo Aged has really brought it all together." Ibanez offers torrefied spruce and mahogany tops, as well as mahogany backs and braces on select models. Facciolo says that the process is a win-win for Ibanez and is definitely worth the extra production time and cost since it helps the company achieve its mission of offering the best guitars possible and creating a good playing experience right from the start.

Facciolo describes the tone of these guitars as live, more dynamic, with a sweeter high end and an expanded reach."It just makes a better guitar, and this is only the beginning for us."

Having produced some of history's "holy grail" acoustic guitars, Martin is in the rather unique position of striving to recreate its own vintage tones. Although the company has worked with torrefaction in the past, Martin has developed its own proprietary Vintage Tone System (VTS), specifically engineered to recreate the sound and playability of great Martin guitars from the 1930s and '40s. According to Jeff Allen, vice president of global manufacturing and operations of Martin Guitar, "It allowed us to get the tone closer to an old Martin that had naturally aged."

Martin uses the VTS process on its high-end Authentic series guitars. The company describes it as a combination of specifications, procedures, materials and parts designed to mimic a naturally aged Martin as closely as possible. Using vintage guitars as a model, Martin worked on replicating the tone, color and even the cell structure of these instruments.

"We desired something that sounded older and closer to a Martin that had been played for 75 years versus a brand-new Authentic series model," Allen says. "We found that the top, bridge plate and the braces provided the best results when they have undergone VTS."

Torrefaction is certainly not the first "sonic aging" technology to come along, but many industry experts agree that is one of the most significant. The process is currently being used by numerous companies, large and small, with more coming on board every day. It has proven to be an asset on guitars at nearly every price point, and players are beginning to take notice. Although debates continue over whether torrefaction actually makes a new guitar sound just like a vintage one, there appears to be no debate over the fact that they definitely do sound better. **DB**