



*Behind the scenes at Martin, Taylor, Ovation,
and other top companies*

By Teja Gerken



FACTORY TOUR

Martin's brand-new guitar facility.

THERE ISN'T A MORE HEATED topic among guitar enthusiasts than the handmade versus factory-made debate. The word *handmade* is used to describe instruments ranging from custom creations made in one-person shops without power tools to guitars cranked out by large factories. Historically speaking, the most desirable flattop steel-strings have not been crafted individually but manufactured in well-known factories. Famed archtop builder John D'Angelico built only 1,164 guitars during his entire career (1932–1964). By contrast, C.F. Martin and Co. was already producing close to four times that many instruments *each year* by the time the company hit its Golden Era in the '30s.

Despite the plethora of highly skilled individual luthiers building guitars nowadays, the vast majority of flatpickers and steel-string fingerpickers are still playing instruments that were built in factories.

The main advantages of factory-made guitars is that they're generally more affordable than custom instruments, and prospective buyers can test them out in advance and hand-pick the instrument that speaks to them. Testing existing guitars also makes it much easier to compare makes and models. Custom orders, on the other hand, may or may not turn out to be the guitar of the buyer's dreams.

Another advantage to factory-built guitars is frequently a higher resale value. Unless your custom guitar was made by one of a few hot luthiers, it could be quite difficult to sell without taking a significant loss. And the more "custom" the guitar is, the more difficult it tends to be to find a new home for it. Amazing guitars with people's names inlaid in their fingerboards, for example, collect dust in music stores. Your tastes will change over time, and even though it might seem unthinkable when you place the order, there may be a time when you wish to part with your current dream guitar.

When it comes to understanding how factory instruments are actually built—which steps are carried out by machines and which by human beings, etc.—misconceptions are rampant. I heard someone at a Martin clinic ask repairman Richard Starkey, “Did you build *that* one?” I’ve also overheard people saying that “Taylors are essentially built by robots.” The truth is of course that nobody at Martin works on the same guitar from start to finish (with the possible exception of model prototypes) and that while Taylor has pioneered the use of computer-controlled (CNC) machines, the company’s 246 employees are still the ones building the guitars.

I recently visited the manufacturing facilities of Lakewood, Larrivée, La Si Do (makers of Seagull, Godin, La Patrie, and Simon and Patrick guitars), Martin, Ovation, Tacoma, and Taylor. I was fascinated by the different approaches the companies took to solving the problems that come up when turning raw lumber into great-sounding, playable guitars. I can’t explain each company’s manufacturing process from beginning to end, but I would like to walk you through some of the basic steps and share some of the surprising discoveries I made.

SELECTING THE WOOD

The first step in building most guitars (excepting those built of composite materials—see “Beyond Rosewood and Spruce,” September) is selecting the woods that are to be used. Some companies, such as Canada’s Larrivée, actually harvest a portion of their tonewoods themselves, and most are capable of resawing logs into guitar-friendly sizes. However, wood for guitar tops, backs, and sides is often bought in pre-cut book-matched sets. Given the volume of wood needed by major guitar manufacturers, it is impossible for an entire shipment to be of uniform quality, so it is generally graded according to the model in which it is to be used. Martin, for example, divides spruce tops into eight grades before assigning it to specific guitars. Spruce that isn’t high enough in quality to be used for tops on standard Martins gets used for the company’s line of Backpacker guitars or for bracing.

BUILDING THE BODY

Once the materials have been selected, the various parts are further processed. Book-matched top halves, for example, are glued together, and decorative strips (such as herringbone) are often glued up between back halves. Different companies use different methods to

The next step for most of the manufacturers is planing and sanding the top, back, and sides to their final thicknesses. Most factories use automated machines to carry out the task. Larrivée, for example, uses a rotary plane which quickly gives the parts their exact measurements.

Perhaps one of the most mysterious processes for non-guitar builders to understand is how the sides are bent. No matter what tools are used to do the job, the magic ingredients are always moisture and heat. Although some companies, such as Martin, use traditional bending irons (essentially a



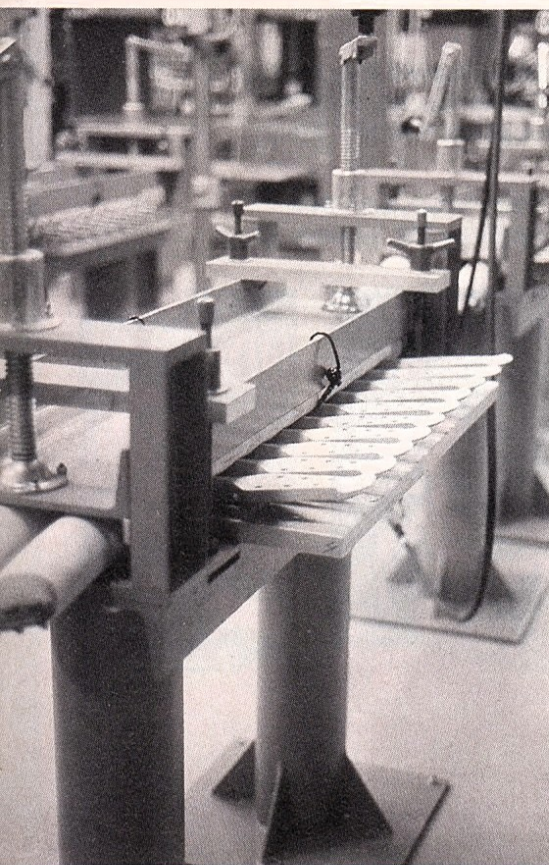
PHOTOS BY TEJA GERKEN

clamp the halves together. In my opinion, no method is as spectacular as Martin’s huge paddlewheel, which the company has used since the ’30s. Rotating slowly, the machine allows 18 backs to be worked on simultaneously. The glue has just enough time to dry within one revolution, and a worker loads and unloads the machine as part of the process.

Top to bottom: vacuum pressure is used to glue braces at Taylor, guitar bodies are sanded at C.F. Martin and Co., and laminated neck blanks are readied for carving at Ovation.

heated pipe) for shorter model runs and for certain cutaway models, the more common method is the side-bending mold. The mold resembles half of a guitar body. Workers soak the wood first and then clamp it into position in the mold, which heats up the wood until it conforms to the proper shape. One interesting variation on this method of bending sides is used by Tacoma to bend the sides of mandolins. A horizontally arranged workstation houses an inside mold in the shape of the mandolin body, as well as an outside mold split into several sections. A hydraulic mechanism bends the wood into shape.

The bent sides are then joined to the endblock and the neck block via glue and clamps. The sides present very little surface area on which to glue the top and back, so kerfing—



Ovation uses inflated fire hoses to glue fingerboards onto necks.

usually slotted strips of mahogany—is glued to the front and back edges. Many makers use clothespins to clamp the kerfing in place, but others use small woodworker's clamps, office binder clips, or aluminum clamps developed specifically for this purpose and marketed by Taylor Guitars.

Before the body can be assembled, the top and back need to be prepared. The procedures vary widely from manufacturer to manufacturer. Most shops cut the soundhole out of the top, inlay the rosette, and glue all the bracing into the top and back before proceeding. (Tacoma Guitars, however, uses a CNC machine to cut soundholes out of some of its models after the bodies have been assembled, and La Si Do glues its back braces to the sides and kerfing first and then lays the back on top of them for gluing.) Most companies use precut (and in many cases prescalloped) braces made to the particular model's specifications—either on a CNC machine or using templates and more traditional machinery—and glue them in place with vacuum pressure rather than clamps. This method allows for completely even distribution of pressure. Some glue the top and the back in separate

steps, while others handle both operations at once. Some, like Lakewood and Taylor, use large clamping mechanisms specifically designed for this process, while others, including Larrivee, depend on traditional go-bars (flexible rods made out of wood or fiberglass) to exert the pressure needed for assembly.

For most makers, the next step is routing the top and back edges of the body to make room for the binding. This can be accomplished with a hand-held



Martin has used this paddlewheel to glue tops and backs since the '30s.

clamping mechanism. All manufacturers then sand the body by hand and most brush on a coat of grain filler before sending it off to the spray booth for finish.

THE NECK

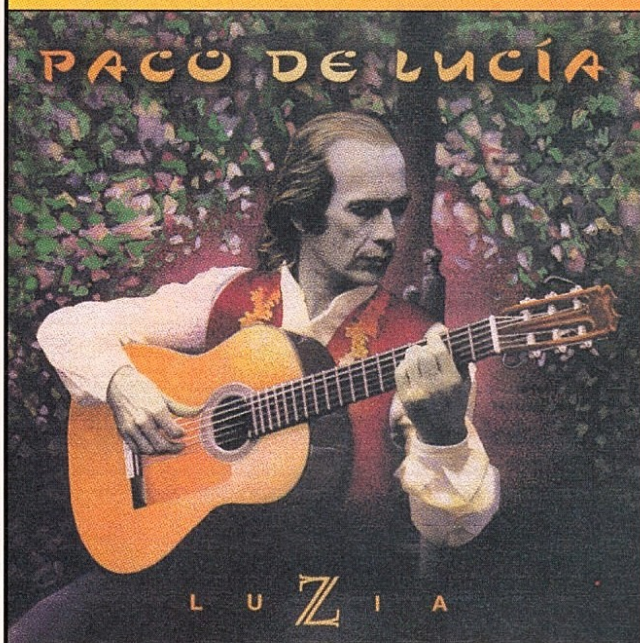
Necks were some of the first guitar parts made with CNC machinery. Achieving absolute uniformity in size and shape from one neck to the next has always been a high priority in the factory environment, and CNC allows

I was fascinated by the different approaches the companies took to solving problems that come up when turning raw lumber into great guitars.

or a stationary router. Wood binding needs to be bent to shape (like the sides) in advance, while plastic binding is flexible enough to follow the necessary curves during gluing. Most companies use adhesive tape to secure the binding while the glue is drying, but some still use rope or, in the case of Ovation, a hydraulically operated

extreme precision while simultaneously speeding up production. In a matter of minutes the CNC machine transforms a raw block of wood into a neck blank ready for a truss rod and a fingerboard. Some manufacturers set up the CNC to cut several necks at a time. Many companies, such as Martin and Ovation, hammer the frets in place before the fin-

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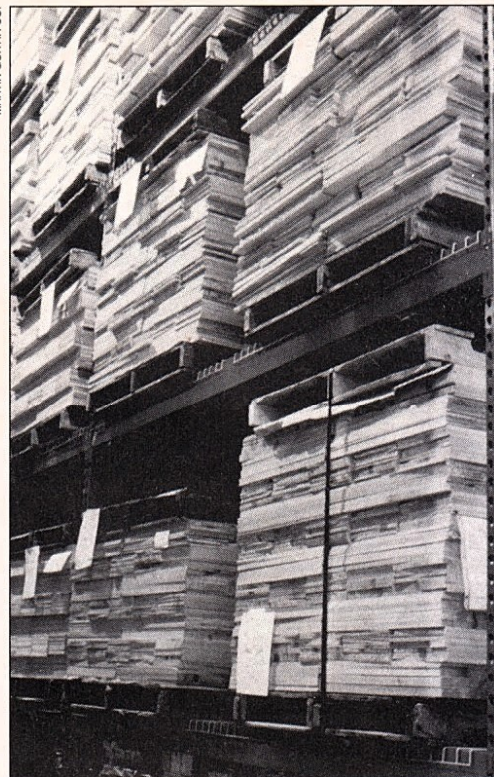


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gerboard is glued to the neck; others, like Lakewood and La Si Do, wait until just before the neck is mounted to the body; and Taylor even waits for this operation until after the neck is installed to the body on many of its models. Fingerboards are glued to necks with a variety of clamping devices. One method used by Ovation and Tacoma, among others, utilizes inflated fire hoses to exert the necessary pressure.

Next, the peghead veneer is glued on, the holes for the tuning machines are drilled, the fingerboard markers are inlaid, and, in the case of bolt-on necks, inserts for screwing in mounting bolts are installed. The neck can now join the body for final sanding and finishing. Some manufacturers use the same finish they used on the body, while others prefer a more matte finish for the neck. Although necks and bodies may move through the spray booth via conveyer belts, the actual spraying is done by hand, ensuring the proper thickness of coats. Lacquer finishes can take several days to be completed, but UV-cured finishes may harden in a matter of minutes. Which kind of finish a manufacturer uses tends to have a significant impact on workflow.

ASSEMBLY, BUFFING, AND SETUP

Once the body and neck are finished, the final assembly of the instrument be-

gins. Most companies have already test-fitted the neck to the body before the parts were finished, so at this point it is more a matter of fine-tuning the fit and gluing or bolting the two parts together. Many bolt-on neck designs still depend on having the extended fingerboard glued to the top of the instrument.

Before the instruments are shipped, they need to be buffed and set up. Buffing is a delicate and time-consuming operation, which is why satin-finished instruments (which need less buffing) tend to cost considerably less than those with high-gloss finishes. Employees who

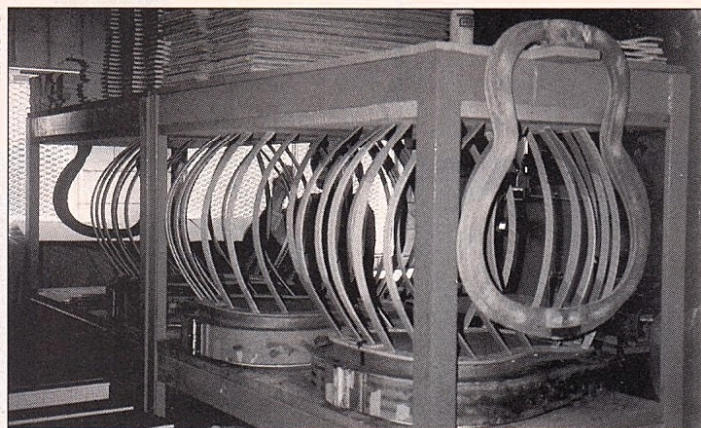
operate these large buffing wheels have to be extremely careful because the machine has enough force to rub right through the finish or even grab the guitar out of the operator's hands.

After buffing, comes setup. Most companies have one employee do the

entire setup, which plays a crucial role in how the instrument will be perceived by customers in music stores. Premanufactured nuts and saddles are fit into their respective slots and are then filed and sanded so that the action meets the manufacturer's specifications. The tuning machines and pickguard are then installed, and the guitar is strung up, tuned, and test-played. Some companies, including Martin, will store the guitar for a few days, allow it to settle, and then check the action and playability once more before shipping the instrument to the dealer or distributor.

FINAL THOUGHTS

Although I did see some impressive industrial machinery on my factory tours, I was astonished by how much of the work is still accomplished by skilled hands. There are no machines that inlay abalone, precisely fit necks to bodies, install binding, or even fine-sand guitar bodies. Whether an instrument is coming off a fast-moving production line or out of an individual luthier's shop, these and many other procedures have to be done by hand. In the end, what makes a fine instrument is not a particular bracing pattern, neck joint, or headstock shape, but the care that goes into its design and all the steps of its manufacture, from wood selection to final setup. ■



Larrivée uses the traditional go-bar technique to glue backs to sides.

The final assembly step for most manufacturers is gluing the bridge onto the top. Most companies premanufacture the bridges with either a CNC or a more traditional machine, and it's more efficient if they use the same bridge on



A La Si Do employee oversees the gluing of bridges and fingerboards.

a variety of models. Placement of the bridge is crucial, and templates are used to ensure exactness. Wood-to-wood gluing is best, so manufacturers either cover the spot where the bridge is to be placed with tape prior to finishing the top or scrape away the finish before gluing on the bridge.



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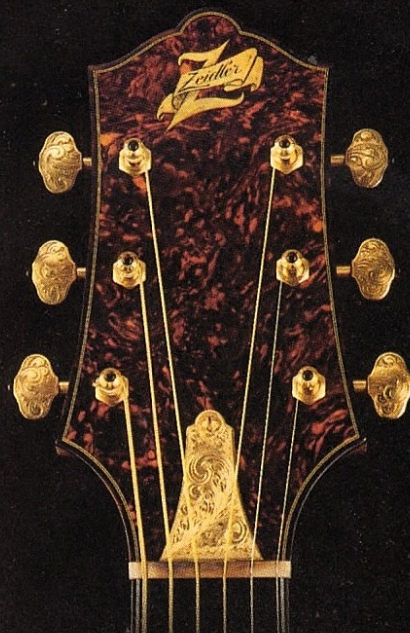
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