

Aluminum Makes One Sweet Guitar

In recent days, aluminum seems to be getting a lot of play. Aluminum is attractive and lightweight, and as nature's most abundant metal, it is plentiful, easy to work with and readily recyclable. These features make aluminum attractive for a variety of consumer products.

Much of the steel we use – such as in our cars – is also recycled, but when you consider what can be created by recycling that beverage can, it makes the effort seem more worthwhile.

One consumer product utilizing aluminum in its construction is the new Apple notebook computer. It has a unibody construction made from extruded aluminum, which is CNC precision machined to cut the keyboard holes. Lasers are also used to perforate the speaker-grill holes. The finished parts, like this computer, are then typically polished and may be anodized or coated.

The extrusion process is the key thermal “treatment” for many of these alloys. In this process, billets of aluminum are heated to temperatures ranging from 700-930°F. The material then goes through an extrusion press with pressures ranging from 100 to 15,000 tons. A soft alloy taking on a simple shape can be extruded at a rate of 180 feet/minute or more. Some aluminum alloys require further thermal treatment, but many used for extrusion are designed to be used as-extruded.

Another use of extruded aluminum makes much nicer music. Pictured on this page is the only arched-top aluminum guitar on the planet. Like the computer, extruded aluminum is used to fabricate this beautiful instrument. The material is laser-cut, 0.080-inch-thick 5052 aluminum. The top is subsequently formed with the arch in both the side-to-side direction as well as top-to-bottom. A single long strip, which has been annealed to enhance formability, is then formed around the arched face and welded in place. MIG as well as TIG welding is utilized in the production of this guitar.

Once the aluminum body of the guitar is fully assembled, it goes through the finishing process. Several treatments are available for aluminum, and all of these are options for this musical instrument. They in-



clude anodizing, liquid coating, powder coating and others. The pictured guitar was anodized, which is an electro-process that forms a durable, porous oxide film on the surface of the aluminum extrusion. This is accomplished by immersing the aluminum-extruded profile in a tank containing an acid-based electrolyte. A current is passed through the tightly temperature-controlled solution. The extruded part serves as the anode, so the electrolyte releases oxygen ions at the surface of the profile. The oxygen immediately combines with the surface aluminum to form a hard aluminum-oxide film. Organic and inorganic dyes as well as metal oxides can be added to this process for color.

Powder coating is another process used for extruded aluminum. It is a finishing process that heats ground pigment and resin to encase the product instead of coating it with liquid paint. This process has been around since the 1950s, but this “dry painting” technology has improved significantly in recent decades. Finely ground, electrostatically charged particles of pigment and resin are sprayed onto electrostatically ground surfaces where they adhere. The dry-powder particles are then heated and permanently fused to the surface in an oven at maximum operating temperatures of 500°F.

The guitar's final assembly process connects the wooden neck to the all-aluminum body. People who have played this extruded-aluminum instrument comment that the notes resonate longer and sustain stronger. The descriptive comment made by several folks is that the “notes are like honey.” If, instead of an electric guitar, you are in the market for a bass, an all-aluminum one is currently being prototyped. Now you know how thermally processed metal makes sweeter music. **IH**

