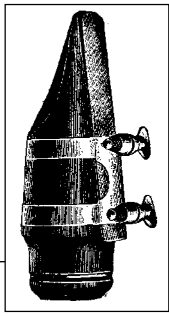
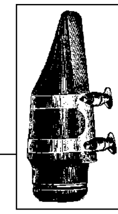
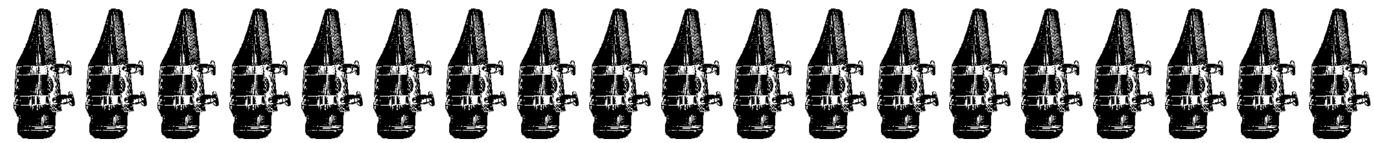
Ralph Morgan



The Saxophone Mouthpiece

Does The Material Used Make Any Difference In How Mouthpieces Play?





Does the material used make any difference in how mouthpieces play?

In my last two columns, we looked at the various types of materials used for mouthpieces, which included wood, metals, synthetics, and crystal. We also looked at a few of the manufacturers of these mouthpiece types. In reality, the type of material does have a distinct effect on such things as tone quality, projection, response, etc., but there are also other aspects of the mouthpiece which we should associate with these effects.

GRENADILLA AND ROSEWOOD MOUTHPIECES

First, the woods used in the earliest mouthpieces were comparatively soft, such as various fruitwoods and boxwood. This type of wood was very workable; most examples are beautifully carved and finished. It seems at the time that the very warm, rich tone quality of these was desirable. Of course, we are now talking about clarinet mouthpieces made long before the saxophone was invented. By 1840 grenadilla and rosewood were in common use for the clarinet and, thus, for saxophone too. The earliest, wood, saxophone mouthpieces in our archives were made in France by Buffet. grenadilla was far superior to boxwood. It had much greater density and a specific gravity of over 1.0, such that it would not float. The grain was more pronounced; the tone produced was more brilliant and richer in midrange harmonics. Therefore, grenadilla enhanced the saxophone sound. The chambers of these grenadilla saxophone mouthpieces were round and quite large with a concave roof from tip rail to throat; thus, the dark 'fat', almost hollow, sounds we associated with these mouthpieces are how we think of them. Due to the thinness of the walls, they were very resonant in feel, acting to enhance the reed vibrations. Due to the relatively low physical strength of these wood mouthpieces, compared to hard rubber or metal, we normally find a metal ring of some sort applied around the shank to prevent cracking when pushing the mouthpiece onto the neckpipe cork.

The workmanship on the grenadilla wood mouthpieces was usually flawless. The material was still soft enough that constructing an accurate facing curve on the side rails is a very touchy operation. Just a little extra pressure will cause a slip in the proper curvature. It seems obvious that using modern machinery to apply a facing and table should result in an accurate cut. Unfortunately, wood has a tendency to spring away from the cutting tool, resulting in a variety of products. The cutter is programmed to just cut, not compensate.

AMERICAN HARD RUBBER MOUTHPIECES

Hard rubber became "the thing to use" after Harvey Firestone discovered how to vulcanize, or harden, natural gum rubber. This happened none too soon since the need for clarinets and saxophones grew rapidly in the late 1800s. The new, hard rubber offered a plentiful and inexpensive material. Tolerances could be kept much closer than with wood and it proved to be more stable. Hard rubber also retained the curves of the facing quite accurately, regardless of extreme conditions, such as temperature and humidity. It was also not subject to cracking and excessive wearing caused by the upper teeth. Note that, with minor variations in formulae, hard rubber is still the foremost material used worldwide. To determine the comparative hardness of various hard rubber products, whether a hockey puck, an ACE comb, or a mouthpiece, we refer to a hardness scale of numbers called "Shore D."

SHORE "D" HARDNESS SCALE FOR HARD RUBBER MOUTHPIECES

Most ebonite used for mouthpieces registers between 82 and 95 on this scale. The softer, or less dense, rubber measures in the lower 80s and produces a darker sound, while the higher readings on the Shore D scale are produced by harder rubber, more dense, and produce a progressively brighter tone quality. It should be noted that readings below 82 will produce a dull or flat sounding mouthpiece, while readings above 95 will generate a hard or 'brittle' sound. It is possible to vary the Shore D hardness of ebonite by using different formulae of a rubber mix.

The raw natural rubber comes in several varieties, produced by various curing methods. There are many types of 'lamp black,' or carbon, to use as an additive. You may think it strange to first produce hard, vulcanized rubber, then pulverize it, so it can be used as “rubber dust,” an important filler additive in the ebonite mouthpiece. No wonder that, if you ever have the urge to get an analysis of some hard rubber mouthpiece, the analyst will caution you that he can only do so to an accuracy of 85%. It seems hardly worth it. Then comes the matter of color.

Traditionally an ebonite mouthpiece is black, or nearly so. However, the W.S. Summer Co. made some several years ago which were a dark red. This was also tried by an English maker. It seems that the addition of a coloring powder tends to produce a much softer product that really not well-suited to retain a carefully faced curve without warping. Also the coloring in some instances, even certain lamp blacks, tends to bleed out, especially then they are refaced.

In producing an acceptable rubber compound, the rubber chemical engineer will try many different types of ‘filler,’ mostly different rubber dust samples, although some synthetic ones are used as well as varying amounts of certain chemicals, which affect the malleability or molding characteristics of the rubber. In so doing, the engineer can come up with many hundreds of formulae. Then we must determine which will produce the most desirable tonal and response characteristics. Once this has been determined, we must be aware of other variables which will dramatically affect the acoustical and aerodynamic results.

Foremost is the thickness of the walls of the mouthpiece. Perhaps this is best understood by considering my experience while working while working on the clarinet mouthpiece. Gustave Langenus produced an excellent product in the 1930s and 40s, using his experiments in a different graduation of thickness for the beak area. As one might suspect, he found that a thinner material can be more easily set in vibration than a thick one. In my trials, I started with a “normally” shaped mouthpiece. In filing and scraping the beak area, I found that, as the material was thinned, the response and tone production suffered progressively. At a point somewhere near half the original beak thickness, the clarinet ceased to play, emitting mostly buzzes of various pitch levels. However, when the appropriate thickness was reached by more thinning, the sound and response suddenly reappeared at a greatly enhanced level. In other words, the walls of the mouthpiece can either act with a damping effect or as an auxiliary tone generator for the poor belabored reed. Then the entire scale of the instrument speaks more quickly and evenly, with a more centered sound and “feel.”

The same changes pertain to saxophone mouthpieces as well. They become very evident to the player when comparing our own regular Morgan MI models of alto and tenor mouthpieces with our Excalibur models, which have the same facings and chamber characteristics, but in which the body walls are significantly thinner. This enhances the production of higher partials, thus a more brilliant tonal characteristic.

Referring to the Lelandais’s line of the 1930s, they seem to have been one of the first to have used this technique in their ‘Le Jaseur’ line. The shape of their clarinet, alto, and tenor seem to have been inspired by the very oldest Selmer metal mouthpieces. Lelandais also started the ‘streamlined’ mode early on, which has contributed to many such models by more contemporary makers. Again, it is evident that the body wall thickness has a profound effect on the tonal aspects of the mouthpiece.

METAL SAXOPHONE MOUTHPIECES

Metal mouthpieces are not subject to the same tonal changes we note in hard rubber, since the average thickness of material used can do nothing but act with a damping effect on the reeds vibration. We tend to ignore the fact that the reed, in beating or vibrating against the mouthpiece, seems to act independently; one of the factors that affects the response of the reed is the ease (or difficulty) with which the mouthpiece material is set into vibration. Many players I’ve discussed this point with are sold on the use of only metal because a long list of prestigious players has used that type of mouthpiece. They do not take into consideration the fact that, in the majority of cases, they have only heard a performance using all manner of electronic enhancement and simplification, either live or on CDs / records / tapes. Therefore, what we hear may be far from what the player, mouthpiece, and instrument actually sound like, due to the whims of the sound engineer, etc., altering the true sound. Experiments show that a mouthpiece properly designed and made of good hard rubber will produce about 30% more sound overall and play with a more centered sound.

Just as the hard rubber materials can vary widely in density and hardness, causing variations in the sound spectrum produced, metals also vary in composition or alloy, basic metal used, and durability. There are perhaps more alloys in the brass family, ranging from bronzes to ‘plain’ yellow brass. The comparative amounts of copper, tin, lead, zinc, sulphur, nickel, phosphorous, and antimony all contribute to the sound conducting qualities of the metal. Obviously an alloy with less copper content will be harder and more dense, with a greater capacity to resonate. If you have ever compared the sounds of a fine Zildjian cymbal with some of the lesser quality ones available, the difference is heard immediately. There are several alloys of other metals, stainless steel, and aluminum, for example. The hardest of stainless steel was used in the old Berg Larsen models–they hold dimensions perfectly, but require a great amount of work to apply a proper facing curve, especially when changing a mouthpiece from, for example, .090" tip opening to .100" or from a #6 to a #8. This metal, being much harder, has a tendency toward a harder, clearer sound. The use of a soft metal, such as an aluminum alloy, seems to produce a sound devoid of the proper balance of low, mid, and high harmonic wave lengths. Also this metal does not have the tensile strength necessary to maintain stability in the critical measurements needed for a mouthpiece. The tendency toward corrosion can cause a problem, especially if the player has a high body-acidic condition or the playing is done in a salt-air atmosphere. With most metal mouthpieces, it becomes of much greater importance that the basic design be the result of much acoustical and aerodynamic study, so that they will allow maximum efficiency of vibration of the reed since they naturally provide more damping of the reed than hard rubber or synthetic materials.

DISTINCT QUALITY OF SILVER MOUTHPIECES

One metal which does have the capacity, given the correct alloy, to produce a distinct clarity of sound, is silver. Sterling silver, which is 92.5% pure silver, an alloy with a hardness capable of retaining the specifications of a finely made mouthpiece, which resonates at frequencies conducive to the production of a richness of sound not present in most other metal mouthpieces. Playing one is a unique experience, since they do not produce any of the ‘harshness’ I associate with metal mouthpieces. Of course, to be sure of the purity of the silver, look for the ‘hallmark’ denoting sterling which is stamped into the product.

PLASTIC MOUTHPIECES

Contrary to the effect of a coloring agent in hard rubber, we have used a variety of colors or dyes in plastic or synthetic mouthpieces with no detrimental effect. One vitally important property which all mouthpieces must have, regardless of type material, is that they are not carcinogenic or injurious to one’s health in any way. Obviously, this eliminates many metal alloys and synthetic compounds.

Now that you have a more complete understanding of the material side of your mouthpiece, please don’t think that any one aspect of the mouthpiece will automatically cure your problems. Regardless of material used, a poorly designed and / or made piece can’t be made into a royal coach from a pumpkin just by this one change. We must still consider all the aspects at length if the “perfect mouthpiece” is to be found. Good hunting! §