INTERNATIONAL MOLYBDENUM ASSOCIATION
THE VOICE OF THE MOLYBDENUM INDUSTRY

It sounds better with moly!

Some uses of molybdenum are less obvious than others, like helping to produce sound and music. Molybdenum is found in acoustic devices ranging from the utilitarian whistle to a 2.5 tonne fire-breathing organ. When it comes to emitting and propagating sound, molybdenum-containing stainless steels offer resistance to wear and tear.

Unlike pianos, no wind instrument is delivered “factory-tuned” to produce the right sound. This is particularly true for trumpets, where the formation of sound depends on the architecture of the entire instrument: a perfect synchronization between the modulation of breath, the work of the lips, and the labial muscles. If the user does not sound the right note on their lips, even if they press the right piston valves, they generate a “mis-pitching” . The different materials used to make instruments have distinct properties, and these properties are just as integral to producing and controlling sound. Molybdenum can lend hardness or corrosion resistance needed for certain applications, for example, a foghorn blasting in salted mist.

Mouthpieces for brass wind instruments

Over the years, trumpet mouthpieces have become little jewels of technology, machined on digital milling machines in one or more pieces to the nearest hundredth of a millimeter. Traditionally made with brass, sometimes plated with silver, mouthpieces made instead with Type 316 stainless steel have become more popular in recent decades. Brass is a very flexible material, which absorbs vibrations. This acoustic absorption results in a sound that is often soft and more difficult to project into the instrument, which muffles the nuances. Hard stainless steel, on the other hand, projects the slightest vibrations and modulations into the instrument more faithfully and with less effort, giving the musician greater control. Though the softened warm tone of brass is often desirable, stainless steel produces crisper sounds that suit different kinds of music.

Precision Type 316 stainless steel mouthpieces offer the hardest and densest surface available. CNC (computer numerically controlled) machined cup and edge profiles can be adapted to the musician’s lip and even dental morphology. This level of customization allows for increased comfort and possibilities for experimentation with playing styles. Some players also suffer from allergic reactions to brass. Stainless steel offers an alternative and is relatively inert.

Equally interesting are saxophone mouthpieces. Often made of wood, ebonite (a hard rubber) or plastic, these pieces also benefit from the properties of stainless steel. The 2% molybdenum in Type 316 stainless steel helps resist corrosion, which prevents deterioration and changes in playing characteristics. Stainless steel’s hardness also allows for an ultra-fast response time needed to realize the full richness of the saxophone’s overtones. Mouthpieces made with stainless steel also eliminate the need for surface plating, an important benefit for those who are sensitive to nickel plating.

A strong warning with just a small whistle!

Less melodious than the music of the brass instruments, whistles resound in much more particular conditions. For example, sports meetings where the referee’s whistle overtakes the clamors of a fevered stadium! Decibels, a measure of volume, are also crucial when signaling an emergency or distress situation outdoors. A signal must reach 120 decibels to be heard several kilometers away, such as from a boat or the middle of the wilderness.

Sports referees use whistles that resound between 100–120 decibels, louder than chainsaw!

In the more peaceful context of training animals like dogs or birds, the ability to modulate pitch is key. Unlike regular whistles, often made of plastic or light metal, training whistles have specialized shapes that allow for a powerful sound easily controlled by the user. This power and modulation allows a hunter or farmer to recall their animal from kilometers away. Some professional dog-training whistles have the capacity to produce sounds at frequencies too high for humans to hear, blowing a seemingly silent whisper that can be heard by a dog or cat a field away! These training whistles often require a material that resists severe conditions of use, for example, prolonged exposure to water or humidity. Such models use Type 316, or more commonly, Type 440 stainless steel containing up to 0.75% of molybdenum. Type 440 is a martensitic grade whose hardness favors a good projection of sound, guarantees the solidity of the whistle, and protects against mild corrosion.

Other important auditory signals come from marine and truck horns, which are made of Type 316 stainless steel. This material resists salty or highly polluted atmospheres associated with road salt and dense traffic – and delivers the powerful blast of a less-than harmonious sound!

Bells to protect and be protected

The range of metallic tinkling also finds an echo in the bells that hang on the collars of domestic animals. Unfortunately for would-be predator pets, small animals are warned by the jingling of the bells triggered by the slightest movement. This also scares bears away from bell-clad human hikers. Worn whatever the weather, be it polluted, wet, or salted fog, bells made of Type 316 stainless steel will likely outlive the outdoors enthusiast to which they are attached. Resisting corrosion and wear for decades, these bells are essential for many hikers and outdoors professionals.

Finally, leather-clad bikers also equip their motorcycles with lucky bells, which protect against evil spirits said to line the roads. Hanging as close to the ground as possible, under their steel mount, in the smoke of the exhaust pipes, these Type 316 stainless steel "punishers" are neither afraid of pollution nor evil "gremlins"!

The ringing of a "gremlin bell" is said to irritate and dispel evil spirits lurking on the roads.

Fire Organ: The thermal chant of stainless steel

A true sound sculpture, the "Fire Organ" is a dramatic reimagining of an experimental 19th century instrument. And the result is nothing less than spectacular! A unique work created by a French artist, the massive fire-breathing instrument on the island of Réunion faces a corrosive coastal environment combined with the heat of many gas burners. This "beast" of fire and sound is played preferably in semi-darkness to better ignite the senses and the imagination. The principle is simple: flows of hot air jets ignited by keystrokes rush into the tubes, which then vibrate, creating a real supernatural concert of sounds that range from animal-like cries to the dull rumbles of volcanoes.

Artist Michel Moglia performs with the fire organ and a flamethrower.

The fire-shooting organ or "pyrophone" dates to 1873 when composer and musician Frederic Kastner first patented an "exploding" organ that used hydrogen and glass tubes. However, the inventor acknowledged a "degree of danger" in operating his invention and struggled to popularize it before an untimely death at age 30. Almost 140 years later, the new Fire Organ uses 70 Type 316 stainless steel tubes, ranging from 2 m to 9 m in length! Were it not for the miraculous corrosion mitigating properties of the 2% molybdenum found in Type 316 stainless steel, this beautiful instrument and its seaside concerts would not be possible.

These sonic devices embody molybdenum's humble contributions to the arts. In particular, the hardness of stainless steel allows for unique, crisp, precise sounds. Beyond precision, the anti-corrosive properties of molybdenum-containing stainless steel help maintain safety. These steels can be trusted to pierce through salty sea fog to guide ships to shore, to provide warnings on early morning trucking routes, and to recall (or repel) animals over large distances. (Thierry Pierrard)