What is the Right Material for Making Ultrasonic Horns?

Ultrasonic horn stretches and shrinks in length during the plastic welding process like a spring. For example, a 20 kHz horn is typically a one-half wavelength long resonant bar, whose molecules are constantly expanding and contracting 20,000 times per second.

Consequently, the horn is continually under compression or tension. That's why, for manufacturing ultrasonic horns - it is important to consider materials that have a good combination of acoustical and mechanical properties. The following three materials are used to manufacture ultrasonic horn because of their fatigue strength, acoustical properties, and surface hardness.

Let's examine, why, when, and how to use these materials for your specific application.

Titanium:

- Titanium is the preferred choice of material for making ultrasonic horns because of its good fatigue strength, excellent acoustic properties, and good surface hardness.
- Titanium horns can be coated with materials like Carbide, Nickel, or Teflon. for applications that require high amplitude and a harder surface.

Aluminum:

- Aluminum has excellent acoustic properties, that's why large horns over 4.0" (101.6mm) in diameter or 11.0" (279.4mm) in width are generally made from aluminum.
- It is a low-cost material, readily available in a wide range of raw material sizes making it the best choice for making prototype horns.
- Machined quickly and easily reducing delivery time and labor costs. Therefore, an obvious choice to make horns requires complex machining.
- Aluminum's poor surface hardness and moderate fatigue strength can make it unsuitable for long-term, high-wear production applications.
- But aluminum horns can be coated or plated with materials like chrome, nickel, or carbide to help alleviate these problems.

Steel:

- Steel can be heat-treated for a wear-resistant surface, which makes it well suited for applications that cause severe wear, such as metal insertion, welding glass-filled parts, and plunge cutting applications.
- Due to the hardness, steel horns are more brittle and are usually used for low amplitude applications.

In a typical eight-hour shift at your manufacturing plant, a 30 kHz horn might travel 2,020 miles in one year. Therefore, it is best to get expert advice on the right material according to your ultrasonic welding application. Contact our technical experts to get advice for your specific application.

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