Nickel-Graphite vs. Silver-Aluminum in Metal-Filled Shielding Elastomers

Dominic J. Testo
Specialty Silicone Products

Silicone rubber can be filled with metal particles to provide EMI/RFI shielding along with environmental sealing. These particle-filled elastomers are perfect for applications that require sealing and shielding between two metal surfaces. Particle-filled silicones also can be formulated to provide electrical conductivity, and to impart properties such as corrosion resistance. Today, many readers know of these specialty silicones simply as EMI/RFI shielding materials. But there's more to the story.

Silver-Aluminum Silicones

For many years, the filler material of choice for shielding silicones was silver-aluminum. Let's consider why this was the case. During the late 1970s, the price of silver was between $4.00 and $5.50 per Troy ounce. This meant that material suppliers could fill silicones with highly-conductive, silver particles without regard to cost. It's also important to recognize the main buyer for silver-filled EMI gaskets. The U.S. military needed EMI shielding materials, and the Cold War ran the risk of getting hot.

Now let's dig a little deeper into our investigation. The development of the MIL-DTL-83528 specification (also known as the "QPL" in the EMI elastomer world) played an important role in the popularity of silver-aluminum silicones. This full title for this Defense Logistics Agency (DLA) callout is "Gasketing Material, Conductive, Shielding Gasket, Electronic, Elastomer, EMI/RFI." Within this specification, letters are (such as A and B) are used to described different types of materials based on performance.

Back when the MIL-DTL-83528 specification was developed, silver-aluminum filled materials (Type B) were the only technology that could meet the U.S. military's needs. So it's not surprising that silver-aluminum filled silicones were specified on thousands of gasket drawings and prints. As our industry knows, however, changing a product that's been specified for years is no easy task. Yet times do change. Let's look at some more recent history – and another particle-filled silicone.

Nickel-Graphite Silicones

In 2011, silver began approaching $50.00 per Troy ounce. The end-users of silver-aluminum shielding gaskets felt this pinch, and began questioning why gaskets now cost as much as $100 to $400 each in some cases. Gasket fabricators explained how silver prices drove costs, but end-users pushed back on price. This presented an enormous opportunity for Specialty Silicone Products (SSP). Buyers of SSP's EMI/RFI shielding elastomers asked if we could reduce material costs without sacrificing shielding, corrosion resistance, or physical properties. We accepted that challenge.

Where did SSP come from? In 1989, five former employees of GE Silicones started a business. Our chemists had helped to develop silicones when these elastomers were first mass-produced for military and commercial use. As you can see then, SSP is a silicone company at heart. Other suppliers also learned that adding conductive metal particles to rubber could produce a shielding material, but SSP rose above the rest. Using our collective knowledge, we developed the best formulations possible for particle-filled silicones. Today, our customers – and their customers – are reaping the benefits.

SSP's research and optimization efforts yielded a nickel-graphite filled silicone that performs at the shielding levels of silver-aluminum filled products. MIL-DTL-83528 specifies a minimum shielding effectiveness of 100dB. SSP's nickel-graphite formula reaches 125dB. Full test results from a third-party testing facility are available upon request.

In addition, SSP's nickel-graphite filled silicones shows excellent salt spray and corrosion resistance test results along with great physical properties. Even newer technology is now available as shielding elastomers move into commercial applications such as medical, automotive, and wireless technology.

The U.S. military is still a large and important buyer of EMI gaskets, but the marketplace is changing. For gasket fabricators and end-users, nickel-graphite filled silicones combine sealing and shielding reliability with cost-effectiveness. Have you considered these particle-filled silicones for your applications?

Learn More Today

SSP's differentiated product line includes:

- Nickel-graphite and silver-aluminum products made in **continuous roll** form at custom thicknesses and widths. Rolls reduce labor costs, lead times, and waste.
- **Ultra-thin .010"** thick materials for when product designers don't have the space for a thicker gasket
- **Low-Durometer 30 Shore A silver-aluminum** silicone for applications that require a softer material with better sealing properties.
- **Reinforced EMI Elastomers** for thin wall gaskets that need greater tear strength than other materials can provide. These reinforced EMI elastomers are also used when the brittleness of typical filled elastomers cause problems in cutting, packaging, or other applications.

For more information on SSP's unique EMI elastomer product line, contact Dominic J. Testo of Specialty Silicone Products at 518-363-5034, or email dtesto@sspinc.com