STABILANT 22

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# APPLICATION NOTE

## Use of Stabilant 22 on RF Enclosure Seals

### Introducing Stabilant 22

Stabilant 22 is an initially nonconductive block polymer which when used in a thin film between metal contacts becomes conductive under the effect of an electrical field. This occurs at an electric field gradient such that the material will remain nonconductive between adjacent contacts in a multiple pin environment. In addition, Stabilant 22 exhibits surfactant action as well as lubrication ability, providing a single component resident solution to virtually all contact problems.

*When applied to electromechanical contacts, Stabilant 22 provides the connection reliability of a soldered joint without bonding the contact surfaces together.*

In this Application Note, we discuss the use of Stabilant 22 to improve the performance and durability of various types of RF shielding hardware, specifically the electrical connections that ensure their effectiveness.

### Types of RF seals in general use

Electronic devices are designed to prevent unwanted radio frequency signals from entering or being emitted by the device (complying with regulations limiting any interference with *other radio/electronic devices*). A conductive enclosure will form a Faraday cage if its walls are in good electrical contact (usually grounded), so various edge connectors are used to complete the circuit. Some of the common types are:

- The finger stock seal
- The knit or wire braid seal
- The conductive elastomer seal

Each type has features that allow a unique engineering trade-off in the areas of cost effectiveness, RF shielding capability, and of course, durability. Along with a discussion of the vulnerabilities of each type, we discuss the methods of application of Stabilant 22.

## Problems associated with RF seals and enclosures

The materials used for RF shielding each require understanding of which types of corrosive influences and mechanical wear can affect them during the service life of a system. For example, aluminum enclosures are certain to acquire layers of oxide from exposure to air in normal conditions of humidity and temperature. The best results are obtained when a few well sealed points of contact are formed between cases, covers and grounding points.

Any materials used can be prone to galvanic corrosion when components are made with metals of very different electrochemical potential. Again, exposure to air is enough to eventually promote oxidation.

## Characteristics of specific RF seals and Stabilant application

The **finger stock** seal is a series of thin spring fingers, manufactured as a strip of material, cut to size and attached to one part of the closure. On assembly, this makes electrical contact with the other component. There should be sufficient force to ensure that a positive contact is established and maintained, ideally excluding oxygen and moisture from the joint.

Corrosion is typically avoided in electrical connectors by ensuring sufficiently high contact pressure to exclude oxygen, moisture, etc. from the contacting areas. Due to the extended contact area of RF seals, this can be a design challenge. Finger stock seals address this by providing contact at a series of points with acceptably close spacing, at which the closing force is concentrated. This approach is also taken with some formed sheet metal enclosures. Stabilant 22, applied all along the contact areas, will keep the connections reliable for many years.

**Knit or wire braid** seals utilize a compressible wire braid/weave component resting in or clamped in a groove. This type of RF seal is usually arranged so that the braid is part of the cover and seals against the edge of the sheet metal forming the enclosure. Stabilant 22 mitigates the effects of differing case and contact metals, preventing corrosion by sealing out humidity, oxygen and contaminants.

A **conductive elastomer** seal is a molded or extruded strip of conductive elastomer that is used to establish contact between the two parts of the closure. This often includes very finely divided carbon-black (grade “SAF”). Stabilant 22 provides excellent long term protection from corrosion and wear on all of the contact surfaces. One precaution applies to the use of Stabilant 22A, as it contains isopropanol. Where the elastomer type is fluorosilicone or Buna S, the alcohol can cause swelling and degrade the compression set properties of the seal. In such cases, application of Stabilant 22 concentrate is preferred. Please also refer to:

Application Note #21, "Compatibility of Stabilant 22 with Elastomers".

## Stabilant application considerations

The materials used for RF shielding each require understanding of failure modes for the types of conductors that are paired in forming an enclosure. Stabilant 22 offers a single solution to the electrical connection faults that can occur in challenging environments and with time in the field.

Such challenges include temperature cycles, humidity, salt air (in marine applications), and of course, pollution (including cigarette smoke in some indoor locations). These external stresses are not always prevented, even in indoor environments.

We do recommend treatment of RF enclosures when they are first assembled, but many use cases involve equipment that has failed, requiring service. In all cases, ensure that the components are free of bulk corrosion and any thin film deposits, before applying Stabilant 22, to ensure the greatest possible service life for the system.

NATO CAGE/Supplier Code 38948

5mL Stabilant 22 (Concentrate), NATO Stock Number 5999-20-002-1112

15mL Stabilant 22 (Concentrate), NATO Stock Number 5999-21-909-9981

15mL Stabilant 22A (Isopropanol Diluted), NATO Stock Number 5999-21-900-6937

15mL Stabilant 22E (Ethanol Diluted), NATO Stock Number 5999-21-909-9984

Stabilant products are patented. Because the patents cover contacts treated with the material a Point-of-Sale license is granted with each sale of the material.

**SAFETY DATA SHEETS ARE AVAILABLE ON REQUEST**

**NOTICE**

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