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APPLICATION NOTE

Stabilant 22 and Silicone Films on Electronic Contacts

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 issues caused by silicone compounds, affecting electrical connectors, along with cleaning methods and the use of Stabilant 22 (in its concentrated form, or the isopropyl alcohol diluted form, Stabilant 22A) to protect connectors and switches from future contamination and wear.

Contact failures due to silicone films

Silicone treatments with excellent water resistance properties are used to protect some electrical assemblies, including their connectors, in high moisture environments. While the benefits are clear, certain conditions allow silicon compounds to cause problems.

For example, these can combine with metal ions to form restive films such as sodium silicate. Some potentially reactive silicones can be polymerized by catalytic metals, forming thin, glassy films with very high electrical resistance. This reduces the effective contacting surface area, leading to intermittent or nonfunctional contacts.

Situations in which silicone film problems exist

Several situations exist that bring silicone compounds into proximity with electrical contact surfaces and catalytic substances. These include components and equipment as manufactured, along with some unintentional ways that electrical circuits and silicone derivatives meet:

Silicone dielectric greases

In dielectric greases, silicones offer exceptional waterproofing. However, when this material meets contact surfaces, eventual failure can occur as noted above. We categorically recommend Stabilant 22 instead of dielectric greases for application directly on the metal parts of connectors. A non-silicone oil based grease may then be used over the finished connector to seal it for outdoor use or other wet environments.

Silicones used in molding of connector parts (plastic or rubber)

Mold release compounds that are silicone based, used for molded connector housings and boots can introduce some amount of silicone contamination to contact surfaces. Engineers may choose to quantify or avoid these problems, but some cases may still show up for service when contacts become 'flaky'. Stabilant 22 can be used to treat connectors once any silicone film has been thoroughly cleaned off – even the alcohol in Stabilant 22A may not dissolve a hardened film.

Cleaning / contact treatment sprays containing silicones

While the service departments of some companies are aware of the potential problem, some cleaning sprays are still marketed that contain silicones. These have water resistance qualities, but also the long term vulnerability we have mentioned. (Several of these were popular as TV tuner cleaners when those employed multiple open air switch contacts). We recommend the use of Stabilant 22 for electronic switches and connectors, especially in place of silicone types.

Silicone oils used in the equipment (e.g., photocopiers)

Equipment designed to use silicone oils or greases is a unique category. Most notably, in photocopiers and laser printers, these are used to ensure that fusion rollers will not stick to the melted ink particles. The combination of these oils and heated components allows vapors containing silicone components to enter the air surrounding the fuser unit. Where electronic connections are near the fuser (or downstream in cooling airflow), these are most vulnerable - temperature cycles in the connectors will allow contaminants to creep into the contact interfaces. Stabilant treatment of such connectors will prolong their trouble free service life, allowing the equipment to be serviced on a more predictable, routine basis.

Can these problems be prevented?

Yes, most cases can be prevented. Ideally, in the design of equipment, silicones can be kept away from electronic connections. In cases where this is not feasible, isolation may be used – for example, one may enclose a wiring harness mounted connector pair in a sleeve of plastic tubing to minimize exposure to airborne silicone contamination. This, combined with Stabilant treatment, can delay any connector problems almost indefinitely.

How well does Stabilant 22 stop these problems?

If Stabilant 22 can be applied during manufacture of the equipment, the material will act as a barrier to deposition of the silicone. It also keeps moisture and other contaminants away from contacting surfaces. Reduction of mechanical wear is a further benefit that particularly applies to switches, frequently opened/closed connectors and any equipment subject to temperature changes or extremes.

Where contact failure already exists, liberal application of isopropyl alcohol can usually wash away any silicone that has not hardened; application of Stabilant 22A will prevent new contamination and prevent future trouble. If the silicone has already reacted to form an insulating film (e.g., of sodium silicate) it may be necessary to use abrasion to remove the film. In the latter case, it may be worthwhile to replace the connector, as abrasion can compromise the plating (especially gold).

In a production setting, one may have the contact surfaces analyzed in a laboratory equipped for microscopic analysis. In such cases, the lab results may inform choices for the service department, including the most efficient and/or most environmentally acceptable solvent to use in the removal of the contaminant film.

Once a properly cleaned (or new) connector or switch is in place, treatment with Stabilant 22 will prevent the problem from recurring.

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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