STABILANT 22

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APPLICATION NOTE

Use of Stabilant 22 in Mobile Radio

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 address the use of Stabilant 22 and its isopropanol diluted form, Stabilant 22A, in electrical connectors found in mobile communication devices. For more information, please see Application Note #001, which answers the most common questions from users about Stabilant products and their wide range of uses.

Connector problems encountered in mobile and ham radio

While we will be talking about connectors, the problems outlined are also encountered with switches, of which many types can also be treated with Stabilant 22.

Generally, contaminants causing problems in connectors can be broken down into four classes; plain contamination, corrosive contamination, contamination which itself is modified by materials present as part of the connector or by contaminants that cause galvanic corrosion.

Apart from contamination, vibration of connectors can also lead to failure. This could be caused by wearing away of a protective plating, or even an action that would promote the entry of contamination into the connector itself.

Plain contamination can come from many sources as diverse as road salts, tar from smoke, paving material oils, resins from trees, industrial-origin airborne materials, to resins and plasticizers given off by upholstery, carpeting, undercoating or paints and plastics.

While these contaminants are more often found in mobile applications and may actually be concentrated through location of equipment modules near heater, vent, or air-conditioning outlets they may also be found in the home or office environment.

Typically, the contaminant materials will form a thin film on the contact's surface where they will cause problems ranging from intermittent faults and distortion to RF demodulation. In data circuits or microprocessor-controlled equipment even a single malfunctioning contact can crash the system.

Corrosive contaminants are, as their name implies, chemicals that once in place within a connector, can cause corrosion the surface plating on the connector parts. In more serious cases, corrosion can affect the underlying substrate metal. Because corrosion products occupy more space than the original; metal, they can form pockets which can force clean contacting surfaces away from each other causing the connector to fail. Some contaminants can even penetrate the thin gold plating that is commonly used, destroying the underlying material. This is often encountered in card-edge connectors in the chemical or pulp-and-paper industries.

Some metal plating can micro-crack when they and the materials on which they are plated are formed during manufacture of the connector. A good example of this would be tin plating, which during temperature changes, undergoes a crystalline lattice modification which actually alters the dimension of the material, leading to enlargement of the cracks and, as a parallel problem, spalling of the plated surface from the substrate. In this situation, potential corrosive materials can accumulate under the plating, leading to premature failure of the connector. We have encountered cases where storage and shipment of these types of connectors in corrugated cartons (without a sealed plastic protective bag) can cause failures due to the migration of sulfur compounds present in the cardboard itself!

We need not dwell on the effects of the salts used to melt ice on the highways, or salt contamination in ocean-side areas, but people forget that various salts such as calcium chloride, are also used to hold moisture in gravel roads and road foundations.

The third class of contaminants are those, such as low saturation oils, which while they themselves don't cause problems in their original state, can be cross-linked into polymer films because of the presence of other contaminants. For example, many plastics used in connectors are thermo-setting resins and contain catalysts or curing agents which can act on unsaturated oils or partially saturated oils to make them cross link into gummy varnish-like films. The same sort of thing can be caused by some of the rubber materials encountered in connectors or even in automobiles. Where connector materials use the so-called free- machining alloys, the presence of the sulphur which gives these alloys their machinability can cause cross-linking of oils and subsequent connector failure.

The final class is that of galvanic corrosion. This occurs where two dissimilar metals are used in contact in the connector. Not normally found in connectors supplied as mating pairs by reputable manufactures, they are most often found where the male and female connector parts are obtained from different sources. One of the worst matches of this type would be the use of a good gold-plated connector mated to an aluminum bodied connector. More typical are die cast connector shells (forming the ground circuit) which are mated with silver plated components.

The dissimilar electrochemical potentials of the metals themselves will generate a small voltage between the connector components which can result of disintegration of the donor metal and or plating of the donor metal onto the other component.

Uses of Stabilant 22 in mobile radio equipment

Stabilant 22 can be used wherever electrical contacts are used, whether this is in connectors, or in switches. Whether the application is ground, marine, or airborne based the number of places where Stabilant 22 or 22A can be employed are almost too numerous to list.

Whether the radio installation is a small compact unit as carried by personnel, a car or truck mounted unit, or even a large base station, it will usually have been designed in a series of modular units interconnected using connectors. It is on these connectors, as well as the various switches and integrated circuit contacts, that the Stabilants can be used to increase reliability. With many circuits designed to use a minimum of power, such as CMOS frequency synthesizer modules, the power levels in the individual contacts are often so low that even a very small amount of contaminant film will either prevent the units from functioning or lead to false frequency information being entered. With the increasing sophistication of mobile equipment, it is not unusual to find this power-conservation type of design excepting in the final power-amplifier itself. This is done in order to conserve power and/or minimize heat-dissipation requirements.

Many portable units are more likely to fail under severe usage and environmental conditions, which is often when they are needed most. A good example of this might be a severe storm when radio communications are imperative because of power outages. The very weather conditions encountered, together with the intensive usage of the equipment can often combine to knock it out of service just when it is desperately needed.

When connections are less than perfect, thin-film rectification or oxide film rectification effects may occur, making the system more susceptible to the electromagnetic pulses caused by lightning. These may also cause side-band spatter or reduce side band rejection as well as leading to towered signal-to-noise ratios by making the system more susceptible to RF interference from many from other sources. The result is often a jamming of the unit when it is used near high-power sources of RF such as AM, FM or TV transmitters.

The number of connections in most systems has also increased substantially. And while microprocessor control is now making it easier to perform self-checks on some of the new equipment, it has made the same equipment much more sensitive to connector problems, whether they be card-edge connectors or those in socketed ICs.

While the material was designed to substantially increase the reliability of all forms of contacts, Stabilant 22 is also finding increased use as an insertion lubricant for multi-pin IC's. Here it almost eliminates the possibility of bending-under a pin on an

The Stabilants function from DC up through several Gigahertz, at current densities covering the complete range of available connectors. They are used from -70^0C up to 210^0 C and even higher when under pressure.

In what forms is Stabilant available?

Stabilant 22 is packaged in 1 5mL, 50mL, 100mL, 250mL, 500mL and 1 Litre containers. The Stabilants are available in two forms; as a concentrate (simply called Stabilant 22), and in alcohol diluted form called Stabilant 22A. Because of the latter's 4:1 dilution, a given size container of Stabilant 22A will cost about one-fifth the amount of a container of Stabilant 22 for it contains only one-fifth the amount of the concentrate. A third packaging is available for industrial-bulk users. Stabilant 225 packages the concentrate such that it occupies one-fifth the volume of an otherwise empty container. This allows user to choose any desired diluent and saves the added costs of shipping isopropyl alcohol, as well as allowing the end user to use an alternate diluent such as one of the other solvents used in electronics.

What is the difference in use of Stabilant 22 vs. 22A?

The concentrate, Stabilant 22 is most useful where the connections are out in the open such as exposed RF connectors. Where the connections are not too easy to get at or where the user wishes to apply the material to something such as a socketed IC (without removing the IC from its socket) it is easier to use the alcohol diluted form, Stabilant 22A. The isopropyl alcohol diluent serves only to carry the concentrate into the connector.

NATO CAGE/Supplier Code 38948

15ml Stabilant 22 (Concentrate), NATO Part # 5999-21-909-9981

15ml Stabilant 22A (Isopropanol Diluted), NATO Part # 5999-21-900-6937

15ml Stabilant 22E (Ethanol Diluted), NATO Part # 5999-21-909-9984

The Stabilants 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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