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Number 001

# APPLICATION NOTE

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## Stabilant 22 - The Electrical/Electronic Contact Enhancer

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### 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 answer the most common questions users have about Stabilant products and their wide range of uses.

### Where is Stabilant 22 used?

Stabilant 22 can be used wherever electrical contacts are used. It works on circuits using DC or AC frequencies up to several gigahertz. Customers have successfully used Stabilant 22 with currents from nanoamps to hundreds of amps and voltages from small signals to hundreds of volts (with special precautions over 100V). Applications include audio/visual, automotive, avionics, batteries, biomedical, cameras, communications, computing, construction, farming, lighting, locomotive, marine, manufacturing, military, mining, robotics, security, and many more. The number of places Stabilant 22, 22A or 22E can be used are almost too numerous to list. A few cases are mentioned below, while more details are found in other Application Notes.

### Is Stabilant 22 just another contact cleaner?

No, Stabilant 22 is a resident potentially electrically active material which through a synergistic combination of effects enhances conductivity within a contact without causing leakage between adjacent contacts. Thus, large quantities of the material do not have to be "hosed" on as is the case with cleaners.

## **Is Stabilant 22 cost effective?**

As Stabilant 22 can be quickly applied to all contacts and connectors in a system, the often difficult diagnostic determination as to which one of the many contacts are erratic, can often be eliminated.

This can significantly reduce service time in the field and in many cases eliminates the need to return boards for shop service or remanufacturing.

As any service manager knows, the diagnosis of electronic problems, especially where intermittent failures are concerned, is often much more difficult than the actual part replacement, while requiring service personnel of exceptional caliber.

In many cases the use of Stabilants can thus increase the efficiency of existing staff as well as allowing many connector harness related problems to be handled at a much lower cost.

*Many of our users have reported savings from \$250 to \$3000 as a result of using \$3 to \$5 of the material.*

In many electronic applications, unintended demodulation (detection) of RF signals in connectors exhibiting thin film rectification effects can either reduce the signal-to-noise ratio or introduce artifacts which can disrupt data flow. Stabilants can cure these problems.

While Stabilants have been shown to cut costs in both shop and field maintenance, their use in the manufacturing of electronic systems can speed up production and reduce rejections.

## **How does Stabilant 22 work?**

Contact failure is rarely caused by a single factor. Thus, treatments that solve only one problem don't necessarily offer a reliable long term solution. For example, cleaners do not prevent the re-entry of contaminants or the reformation of contaminant films, nor do they offer any lubrication. They must be used each time a connector gets dirty. Lubricants in themselves are rarely cleaners. Corrosion inhibitors are neither cleaners nor lubricants and are often specific to one type of metal or plating. Unsaturated oils used as contact treatments can cross-link under the influence of elastomer or thermoset plastic curing agents (catalysts).

While resident in the connector, Stabilant 22 performs several concurrent functions. Its very presence in the contact gap will prevent the entry of outside contaminants. It has sufficient surfactant action to lift surface contaminants and hold them in suspension. In cases where corrosion products are present, Stabilant 22 will penetrate them and prevent rectification effects.

Due to its high dielectric constant it will act to form a capacitive layer which is in parallel with whatever residual resistance exists in the contact increasing the passage of AC signals. Given sufficient DC bias within the gaps of the contact the thin film of Stabilant will "switch", conducting by quantum tunneling and thus limit the resistance of the contact to a serviceable level.

## **In what forms is Stabilant available?**

Stabilant 22 is available in three forms; as a concentrate form called Stabilant 22, a 99% isopropyl alcohol diluted form called Stabilant 22A and a 95% ethanol form called Stabilant 22E. Both Stabilant 22A/22E are diluted 3:1, however end users can choose to dilute the concentrate 4:1, 5:1, or even further based upon needs of application. A unique packaging, Stabilant 22S, is available as well.

Stabilant 22S includes a bottle about one fourth filled with the concentrate. This allows the end user to control what type and how much diluent is added to the container.

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

Stabilant 22 (the concentrated products) is most useful where the connections are out in the open, such as card edge connectors or where the lubricating properties of the material are useful - such as an aid to installing microprocessor IC's or on switches. 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/22E). The isopropyl alcohol or ethanol diluent serves *ONLY* to carry the concentrate into the connector.

## **What packaging is available?**

Stabilant 22 is packaged in 5ml, 15 ml, 50ml and 100ml containers. The 5ml 15ml, 50ml and 100ml sizes are in dropper bottles. Diluted versions, Stabilant 22A/22E are available in 15ml dropper bottles. Many manufacturers and service organizations make large volume purchases, diluting the material for specific applications used in their production lines or shops. Special orders of 250ml, 500ml and 1 Liter containers may be available upon request.

For some companies using Stabilant 22/22A as a stock store item, we produce labels with customized part or stock numbers. Custom labeling has been provided for many manufacturers who wish to assign their own stock control number, or to distributors who wish to market the product under their own logo. Obviously, this requires purchase of the product in suitable quantities.

## **What is the 15ml service kit?**

This was made up at the request of several manufacturers who wanted a standard kit that they could issue to their service personnel. It consists of a 15ml dropper bottle of Stabilant 22A and some microbrush applicators, all in a small capped cardboard tube that can be tossed into a toolbox with no worry of leaks or damage. As noted, we can provide these kits with special labels when large volume orders are involved.

## **Is it available in a spray can?**

We have not marketed Stabilant 22 products in spray cans for two reasons. Spraying typically wastes the material. Also, intending to be environmentally responsible and safety conscious, we ruled out the use of either a chlorofluorocarbon or a highly inflammable mixture of butane and propane as a propellant. As newer propellants become available, we will evaluate the possibility of introducing this type of dispenser.

It is noteworthy that the solvent impact of Stabilant 22A (the isopropanol diluted product) is only about 1/200th that of conventional contact cleaning solvents over a three-year time span. As Stabilant 22 contains no solvent it has absolutely minimal environmental impact and is, therefore, becoming the treatment of choice for many service organizations.

## **How much should be used?**

Normally, a very small amount is needed. A final film thickness of from 1 to 2 mils (please note mils refers to 1/1000 of an inch or .0254 mm) is all that is necessary. In other words, you want just enough to fill up the interstices between the contact's faces. When using Stabilant 22A/22E, you'll have to use enough so that once the isopropyl alcohol or ethanol evaporates, the desired 1 to 2 mil film of Stabilant 22 remains.

In applications to moving surfaces, such as in slip rings or potentiometers, film thickness should be minimized to the point where "hydroplaning" won't occur.

## **How can I be sure that Stabilant works?**

The best way to find out just how well it works is to try it out - that's why we provide samples (available on request). Almost every service shop or manufacturer has equipment available where the switches or connectors have become erratic over the years. Use Stabilant 22/22A/22E on them and satisfy yourself. A word of caution. Don't try to evaluate Stabilant 22's performance on brand new connectors. Instead, use it on connectors that are corroded, or dirty or just plain unreliable. We are sure that any organization dealing with electronics will have at least one piece of unreliable equipment on which the Stabilants can be tested.

## **Is Stabilant hazardous to use?**

Stabilants have very low oral toxicity. Under normal workplace conditions no skin sensitization effects have been noted. In the undiluted form, it is non-flammable although if heated above 200° Celsius the decomposition products would burn. And Stabilants are environmentally friendly materials. Please note that when using the diluted product (Stabilant 22A or 22E), precautions apply to the small quantity of alcohol being used.

## **Can Stabilant be used by untrained personnel?**

Thousands of applications of the consumer version of Stabilant 22 have been made over a period of 30 years now without any reported problems.

## **What is the best way to apply Stabilant to contacts?**

Stabilant 22 or 22A can be applied in several ways. Inside each Service Kit we include anywhere from 3 to 10 microbrushes depending on the size of bottle you purchase. We recommend putting a drop on the microbrush and then painting that drop on to the male and/or female contacts. The 5ml, 15ml, 50ml and 100ml bottles of Stabilant 22, 22A and 22E are available with a dropper tip.

This allows the liquid to be dropped onto the microbrush or dropped directly onto/around components such as socketed IC's, switches, connectors, etc. Cards can also have their edge connectors dipped into the dilute material.

## **Does the action of Stabilant deteriorate with age?**

In some field trial applications lasting over ten years Stabilant 22 has shown no sign of reduced effectiveness. With a high molecular weight and a very low vapor pressure, little is lost by evaporation. Unlike some other contact protection oils, Stabilant 22 will not cross-link when exposed to free machining materials such as high-sulfur brass, or when used on contacts where agents used to promote cross-linking of thermosets or elastomers are present in the environment or in the actual connector components. Unlike non-saturated oils, Stabilant 22 does not "varnish".

## **Where are Stabilant products available?**

D.W. Electrochemicals Ltd. manufactures Stabilant products in Canada and sells through a network of distributors around the world. A list is available on our website or by contacting us (address, phone and email above).

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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