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APPLICATION NOTE

Use of Stabilant 22 in High Current / Voltage Applications

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 in high current connectors, and outline precautions for higher voltage applications. Please also see Application Note #001 for answers to many common questions users have about Stabilant products and their wide range of uses.

Stabilant 22 use in high current electrical connectors

Some of our early customer success stories are from the field of automotive service, where the classic lead-acid batteries are still used. Current loads of tens of amperes are found in the operation of a vehicle's equipment, such as headlights, signals, radios, ignition circuits, etc. The high current draw of starter motors can be several hundred amps, which motivates the specification of auto batteries by 'cranking amps'.

The use of Stabilant 22 on battery terminals and other high-current connections has the benefits of lower contact resistance and protection from corrosion and other effects of the harsh under-the-hood environment.

The popular adoption of electric vehicles (including hybrids) has introduced higher demands on wiring and connectors than older vehicles. EV's have a multitude of combinations of high current and high voltage in their battery systems, motors and charging components. Customers report excellent results from using Stabilant 22 on connections ranging from charging "guns" to the emerging field of EV battery rebuilding.

Stabilant 22 improves high current connector reliability

The greatest effect of Stabilant 22 treatment is the preservation of contact surfaces. Properly designed high current connectors provide a large surface area over which multiple metal-to-metal contact zones are found.

High current applications (such as automotive or industrial) tend to include corrosive environments. The first effect of corrosion (from regular moisture-promoted oxidation to acid fume etching) is to reduce the availability of those contact areas. The resulting increase in overall resistance will cause loss of available power in the system. High current results in high resistive heating, with potential damage to connectors and their insulation – ‘thermal runaway’ – and loss of available power to the system.

Corrosion is accelerated by vibration and temperature cycles and will cause the system to fail if not corrected. Stabilant 22 not only seals out corrosive influences, but also prevents mechanical vibrations from causing fretting of contacts.

Use of Stabilant 22 for higher voltage circuits

In general, we only promote the use of Stabilant 22 for connectors and switches in circuits that run at voltages *under 100V*, with no special concern. High voltages introduce the necessity of better insulation design for wiring and connectors, which prevents unwanted current flow – anything from small leakage to sparking and corona discharge.

Stabilant 22 has been used successfully by customers who have applied it to plugs for line voltage (household 115/120Vac) and electric vehicle charging ports. The method of application for these connectors is to get the Stabilant coating on the metal contact surfaces, while avoiding any spillage or residue on the insulators. We do recommend that technicians dealing with equipment using voltages over 100V have a full understanding of where such voltages are present.

Please be aware that Stabilant 22 enhances conduction when a high enough electric field is present. This can include the insulating space between conductors that have a high voltage difference. It is not recommended for very high voltages (e.g., over 1000V) that allow sparking over small air gaps.

Stabilant 22 is not recommended for any switch that breaks a high voltage circuit for the same reason. Sparking through a Stabilant 22 coating would eventually decompose the polymer, leading to loss of effectiveness and possible contamination with the breakdown products. As our Safety Data Sheet specifies, Stabilant 22 does not support combustion, but can burn when heated to a high temperature, as a spark would provide. Finally, as with all applications of Stabilant 22, it is the responsibility of engineers and technicians to run tests for any new or extreme use case.

In what forms is Stabilant available?

Stabilant 22 is available as a concentrate (simply called Stabilant 22) or diluted with either isopropyl alcohol or ethanol (products Stabilant 22A or 22E). We recommend the use of the concentrate, brushed onto the electrical contacts, for all applications with high current and higher voltages.

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.

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

This data has been supplied for information purposes only. While to our knowledge it is accurate, users should determine the suitability of the material for their application by running their own tests. Neither D.W. Electrochemicals Ltd., their distributors, or their dealers assume any responsibility or liability for damages to equipment and/or consequent damages, howsoever caused, based on the use of this information. This note is based on the original work of William Michael Dayton-Wright and includes updates by D.W.E. staff.

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