STABILANT 22

D.W. ELECTROCHEMICALS LTD.
70 Gibson Drive, Unit 12
Markham, Ontario
L3R 4C2 CANADA
Phone: (905) 508-7500
Email: dwel@stabilant.com

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TECHNICAL NOTE

Effects of Stabilant 22 on Harmonic Distortion in Connectors

Background

The accumulation of dirt and corrosion films in connectors carrying low-level signal degrades the signal to noise performance of a system. Distortion is also introduced by conduction discontinuities created by those accumulations and films. In this Technical Note, we show results of an analysis of harmonic distortion, with and without the use of Stabilant treatment on connectors.

Hypothesis

Where discontinuities in conduction and rectification effects are present, the distortion caused by them should increase as the signal voltage decreases. Higher voltage and current can break down particulate and film materials, allowing the noise contribution to be lower or even absent with high level signals.

Discontinuities that show up in a circuit's transfer function should show up as a corresponding disproportional high order harmonic distortion, especially as the applied signal voltage is lowered.

Method

Ten 100 contact gold plated edge card connectors were wired so as to place the contacts in series when ten 100 contact gold-plated card edges were prepared in similar manner. Thus, ten sets of connector-edge card pairs were available for testing.

Using a load resistance of 600 ohms, and a test frequency of 1 kHz, a distortion analyzer coupled to a spectrum analyzer was used, under computer control, it measured as many harmonics as could be extracted from the noise floor.

The connector distortion was measured when the units were new. Then they were uncoupled and suspended connected down from hooks under a plywood shield (to protect them from falling material), which allowed air and contaminants to circulate freely about the exposed units. They were left thus exposed for a period of 31 days in a shop which could be considered as typical of a small electronics production plant.

The edge cards were then inserted into the connectors and the assembled units left for another 31 days.

They were removed and their distortion contribution measured using the identical set up as before.

The cards themselves were removed from the connectors and both faces received small bead of undiluted Stabilant along their edge. This was wiped lightly over the connector with a sable brush also saturated with the Stabilant 22 so that there was no significant scrubbing action. They were reconnected and their distortion contribution measured as before.

The connectors were unplugged and exposed for another 31 days, reconnected and exposed for an additional 31 days and measured again.

Results

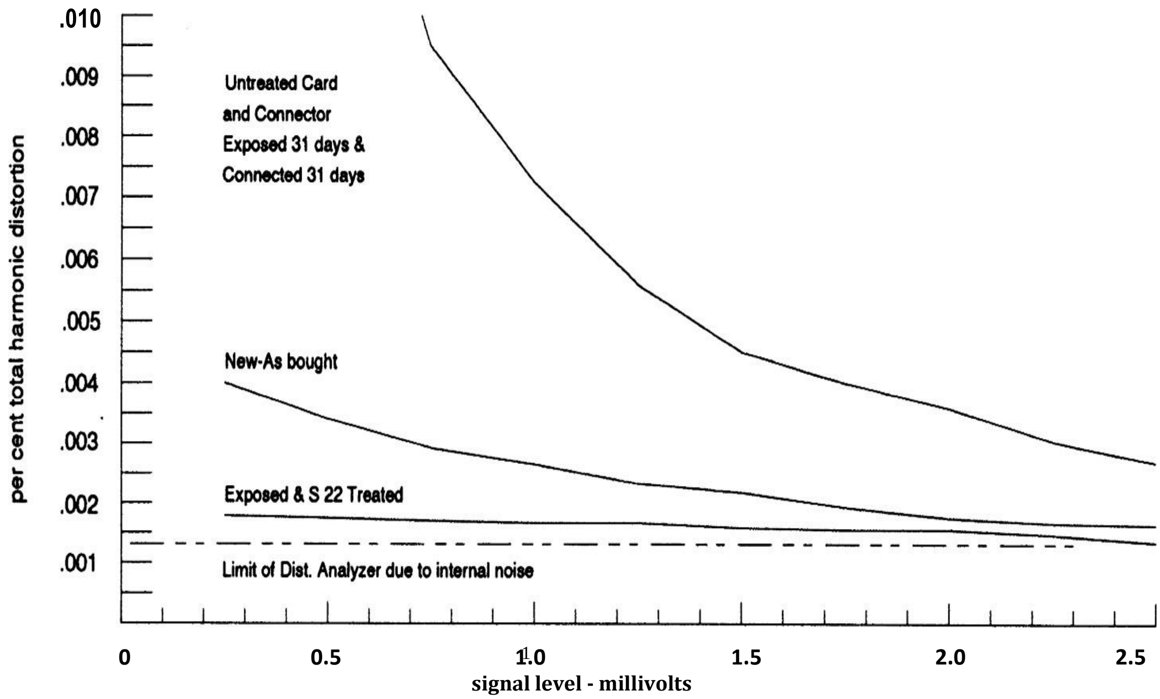

Chart 1*: Total harmonic distortion averaged figures for 10 sets - each with 100 pairs of contacts*

NOTE: No significant difference could be found between the measurements made the freshly treated connectors and the measurements made on the same treated connectors after they had been subjected to an additional exposure period of days unconnected, and 31 days connected.

An additional single 100 contact edge card connector pair was set up and subject to the identical procedures save for the method of application of the Stabilant 22. This was done to see if the method of application would make any difference in the test results. The film thickness was controlled by heating the Stabilant 22 and the card to a temperature of 120°F. The card connection was dipped straight down into the Stabilant 22 to a depth of three eighths of an inch for half second immersion.

It was then lifted straight up and hung for a period of one hour with the edge of the card held 45 degrees to the horizontal. The air temperature during the draining cycle was maintained at 120°F as well. The resultant film thickness was estimated to be in the range of 0.6 to 0. mills. The application was such that no cleaning action was apparent (due to any wiping or scrubbing action) - an analysis of the surplus material that dripped off the connectors showed no significant signs of contamination. The total harmonic distortion lay within the experimental deviation of the figures for the other connector sets and as no significant differences were found. The latter set of results have not been plotted here.

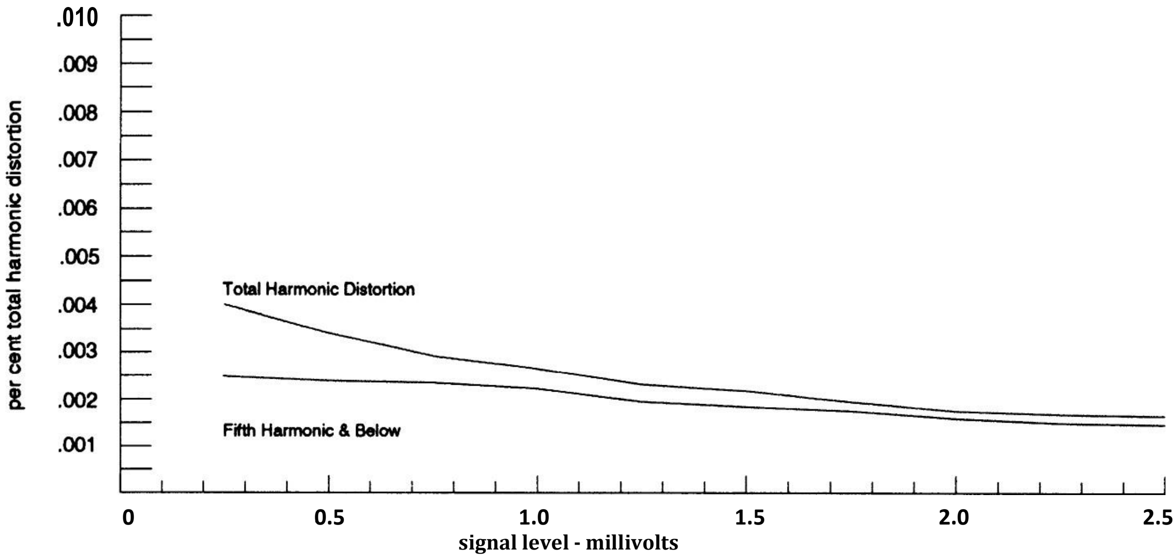

Chart 2: *Total & the 5th and lower harmonic distortion - averaged for ten new connector sets each having 100 contact pairs.*

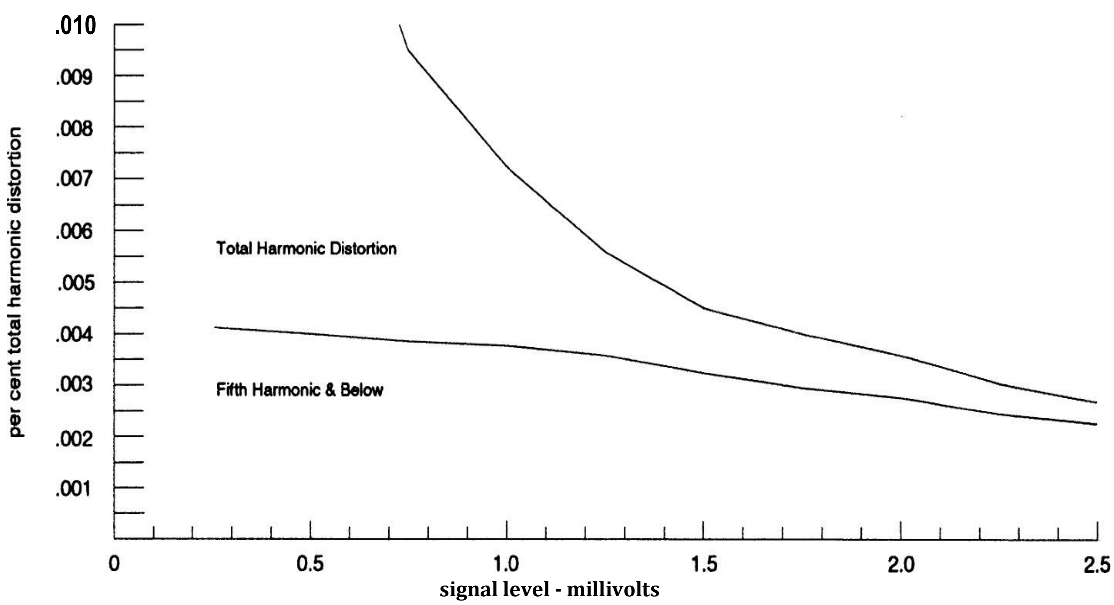

Chart 3: *As above - after exposure for a period of 31 days disconnected (with card edge contacts exposed) and 31 days connected.*

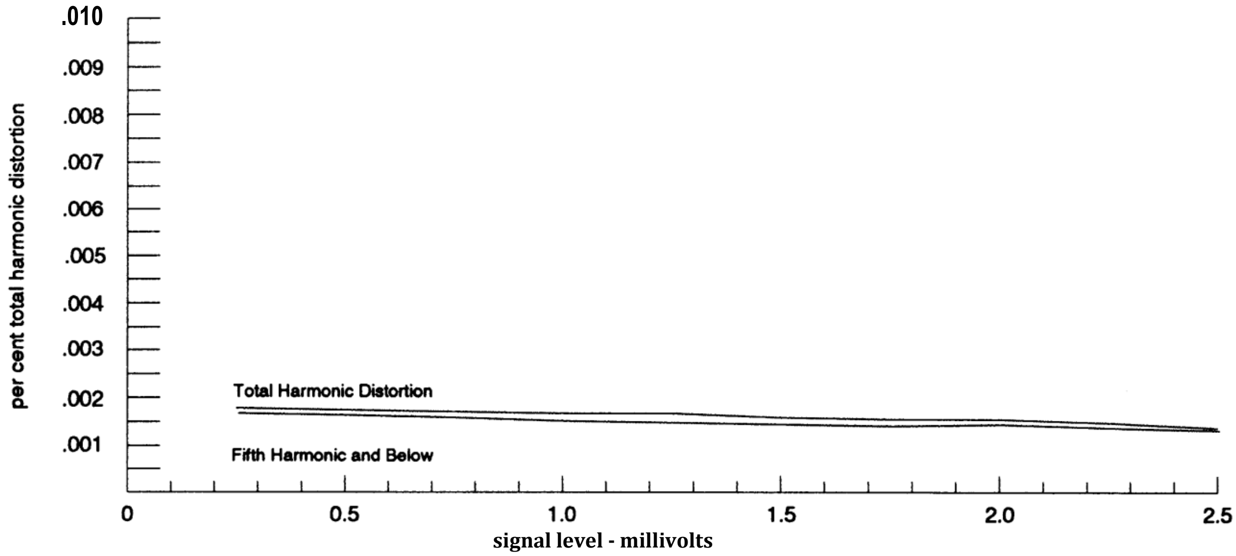

Chart 4: *As above - after treatment with Stabilant 22*

Conclusions

The tests demonstrate that Stabilant 22 has a significant effect in lowering the harmonic distortion in connectors. Furthermore, the tests demonstrate that the use of Stabilant 22 apparently overcomes the discontinuous conduction effects of films and particulate contaminants in connectors. The test demonstrated that this discontinuous effect produced a high proportion of high order harmonics.

Comments

In audio systems, high order harmonic distortion is held to be much more easily distinguished, i.e., standing out as sounding less musical than 2nd to 4th harmonics. This is considered much more critical than lower order harmonic distortions of the same order of magnitude. The use of the Stabilant 22 reduced this high order distortion, apparently by reducing the amount of 'point-contact rectification' within the connection means.

As noted, the ear has been found to be quite sensitive to these higher order harmonics, the subjective effect ranging from 'grainy' to 'glassy' depending upon the level of this distortion present in the signal. In applications such as commercial recording consoles where the signal path involves a great number of connectors. the potential for degradation of the signal is particularly high. The same distortions in a digital system show up as skewed waveforms and can result in timing errors or failure of a receiving circuit to properly detect a ‘1’ or ‘0’. In any system (from audio to high speed digital), such higher frequency noise can couple into other circuits, compounding the problem.

When it is considered that the connectors employed in the test were brand new, and that the period of sixty-two days produced a significant increase in the measured distortion, the potential for this type of signal degradation on equipment that has been in use for several months to several years is very significant.

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.

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