ENGINEERING PRACTICE STUDY

TITLE: HIGH TEMPERATURE SOLDERS USED IN MILITARY SPECIFICATION FILTERS (FSC 5915)

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FINAL REPORT

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OBJECTIVE: The purpose of this Engineering Practices Study was to determine whether any of the QPL suppliers of military specification filters (MIL-PRF-15733 and MIL-PRF-28861) are supplying parts with non-lead (Pb) high temperature solders and if so, how this should be addressed in these specifications.

BACKGROUND: The military component specifications include a prohibition on the use of pure tin both internally and externally. The current standard statement in the filter specifications is as follows:

> "The use of pure tin is prohibited as an undercoat and final finish both internally and externally to the filter body and on all associated mounting hardware. The tin content of filter components, hardware, and solder shall not exceed 97 percent. Tin shall be alloyed with a minimum of 3 percent lead."

(Note: While this standard statement is not included in its entirety in the current revision of MIL-PRF-28861 it will be added with the next specification action.)

This standard statement has evolved slowly over time from a simple pure tin prohibition on the case finish to language which includes undercoating, internal components, hardware, and finally solder.

The proper design of many components, including filters, requires the use of high temperature solders at specific locations. In fact, MIL-PRF-28861 has a stated requirement for the use of high temperature solders for certain solder joints. High temperature solders available include those that have high lead content and some that are lead-free, such as tin silver (SnAg).
The designs of these filters and the solder used have been in place for many years, perhaps decades; longer than the initial introduction of the pure tin prohibition and certainly longer than the inclusion of "solder" into this prohibition.

A conflict exists between our current pure tin prohibition "standard statement" and the use of lead-free high temperature solders. Our standard statement requires that tin be alloyed with a minimum of 3 percent lead. In effect, this prohibits the use of a SnAg high temperature solder. This conflict has been brought to our attention with the DPA failure of some capacitors; the SnAg high temperature solder used obviously did not meet the tin-lead alloy requirement.

The QPL suppliers to MIL-PRF-15733 and MIL-PRF-28861 were surveyed regarding the high temperature solder used in their QPL product.

RESULTS: The survey of the QPL filter suppliers revealed that one manufacturer is using a SnAg high temperature solder. This supplier did not indicate the particular SnAg alloy. This supplier did state that they have had no known failures with regard to their SnAg high temperature solder in any of their product, including MIL-PRF-28861 product. All other QPL suppliers indicated that they use a high temperature solder which has a high lead content.

RECOMMENDATION: It is not our desire or intent to cause the redesign of the QPL product using the SnAg high temperature solder. In order to accommodate the SnAg high temperature solder, language needs to be incorporated into the specifications to allow its use. This language should include the requirement that the tin content of the high temperature solder not be greater than 97 percent.