RGA & Lid-Seal: Waivers, Woes & Wants

Andrew Moor
Northrop Grumman Mission Systems
andrew.moor@ngc.com

Many parts, optocouplers in particular, utilize internal encapsulants as part of product design. While these encapsulants are critical to device functionality, their use often has an unintended consequence of causing false moisture readings during residual gas analysis (RGA) testing. For military products, the Defense Logistics Agency (DLA) has an established process that provides suppliers the opportunity to request and obtain approval of test optimizations (e.g., removal of RGA requirements based on encapsulant usage). Unfortunately, contractual flow-down requirements to perform independent destructive physical analysis (DPA) promulgate the false moisture failure narrative, as MIL-STD-1580 does not have an exemption for test optimization. Ironically, in generating unnecessary waivers, end users are forced to cite the very DLA optimization report to document part acceptance. In resolving the apparent disconnect between suppliers having the forethought to obtain test optimizations, or in the case of commercial parts, obtaining equivalent supplier correspondence, the following recommendations are proposed for consideration:

- DPA houses need better access to information
  - Create catalog of DLA optimizations or supplier correspondence (periodic refresh)
  - Contact DLA or supplier before rejecting a part when excessive moisture is observed
- Add a caveat to MIL-STD-1580 to exempt "moisture" as reject criteria with a valid DLA optimization
- Disposition commercial parts with excessive moisture as "engineering review." Include a copy of any supplier correspondence in the DPA report and allow end users to decide on acceptability
- DPA houses are encouraged to continue contacting end users when anomalies are observed

Another problem than can result in unwarranted waivers is when devices are cited as failing radiographic (xray) inspection for lid seal voiding, while passing leak testing. While some of these failures can be attributed to subjective interpretation of what is classified as a "void", the majority center around the inability to deviate from the "fixed" requirements for voiding percentage found in MIL-STD-883, M2012, for x-ray. Historically, leak test data has been used to justify device hermeticity. As with RGA above, we can debate the merits of adding language to MIL-STD-1580, allowing DPA house's to cite such a justification. While worthy of

discussion, there is a more critical need to focus on a much larger concern that ultimately jeopardizes the validity of such approach (use of leak data) at the core. Specifically, since the adoption of more stringent MILSTD-883, M1014, leak rates and adoption of new testing methodologies, use of leak data has become increasingly difficult, if not down-right confusing to apply. Devices historically deemed acceptable to older leak rate limits, which currently work in end applications, are now classified as failures when tested to tighter Cumulative Helium Leak Detection (CHLD) requirements. Making matters worse, devices that fail CHLD testing still pass when tested to alternative methods, such as Kr-85. The merits of the myriad of test options, along with a deeper understanding of the potential reliability impacts of not meeting new lower leak rate requirements is warranted, along with an understanding regarding the acceptability of one test method's results over another.

This presentation covers test results for two different lot date codes of the same optocoupler for RGA, x-ray and lid-seal testing. For RGA, solutions are proffered to aid in the avoidance of unnecessary waivers. For lid-seal voiding & leak testing, it is the author's primary intent to highlight the disparities between the various leak rate methodologies and to promote discussion on what "passing" really means in the context of historical versus new (lower) leak rates.