Welcome to the Cornell Dubilier’s training module for hermetically sealed aluminum electrolytic capacitors.
We will first have a look at our non-hermetic Flatpack aluminum electrolytic capacitor technology with applications in military and aerospace. We’ll discuss the hermetic seal technology and its advantages over non-hermetic types. Then we’ll introduce our type MLSH, the world’s only hermetic sealed aluminum electrolytic capacitor. We will show how our MLSH capacitors are replacing banks of wet tantalum capacitors.
CDE has been supplying Flatpack aluminum electrolytic capacitors into military and aerospace applications since the early 90’s. These are ruggedized, flat capacitors, with a near-hermetic seal and very long life. The MLP has an aluminum case, rated for 85°C and the MLS is contained in a stainless steel case, rated for 125°C. Many of the programs using our Flatpack capacitors had previously used large arrays of wet tantalum capacitors. You will find our Flatpack capacitors in the most advanced fighter aircraft, radar systems for missile defense, and in commercial aircraft programs.
Early conventional aluminum electrolytic capacitors were known to lose electrolyte, through outgassing, over time. The loss of electrolyte, a.k.a. “dry-out” results in loss of capacitance and increases in ESR. Newer conventional package types such as snap-ins, screw terminal, axial and radial leaded part have come a long way in the past couple of decades. They are less likely to dry-out than the electrolytic types of yesteryear but there is some loss of electrolyte over time and the concern over dry-out still persists today.

Mil/aero design engineers are designing in C.O.T.S. parts where appropriate, but tend to favor our near-hermetic Flatpacks and true hermetic capacitors, including hermetic wet tantalum capacitors, for their mission critical applications.

The graph compares the weight loss of electrolyte with time for a non-hermetic Flatpack versus a hermetically sealed Flatpack. Although the weight loss for the standard (non-hermetic) Flatpack capacitors is minuscule (orange curve), you can see that our hermetically sealed part did not lose electrolyte over time on test (yellow curve).
For applications requiring hermeticity, CDE has patented a glass-to-metal seal for aluminum electrolytic capacitors enclosed in a steel case. Each capacitor coming off the production line is verified to be hermetic in accordance with MIL-STD-883 Method 1014.12.
Cornell Dubilier Electronics introduces its Slimpack, type MLSH, the first in a series of hermetically sealed aluminum electrolytic capacitors that the company plans to introduce over the next several months. With its glass-to-metal seal that prevents dry-out, this capacitor technology has extraordinarily long life to meet the most demanding applications for military and aerospace.

With its long life and the ability to handle 80g ‘s of vibrations, this technology is poised to replace parallel and series banks of wet tantalum capacitors for new and existing designs, especially where bulk storage is paramount. The MLSH Slimpack measuring 1.0” x 1.5” x 0.5” weighs less and has more capacitance than a parallel bank of 3 or more D-sized wet tantalum capacitors at -55 °C.
The initial datasheet ratings shown in the table are readily available from stock. CDE has the capability to produce hermetic capacitors up to 250 Vdc and will be adding more values in the coming months. If the voltage and capacitance values that you need are not shown here, contact us for your specific requirements.
One MLSH capacitor can replace 3 or more D-sized wet tantalum capacitors. Most military aerospace electronics circuits must be designed to operate at -55°C. Wet tantalum capacitors have poor capacitance retention at low temperatures making it necessary for the design engineer to “spec-in” more wet tantalum capacitors just to meet the minimum capacitance requirement at -55°C.

The example shown in the picture and the table demonstrate how 1 MLSH capacitor can replace a parallel bank of four D-sized wet tantalum capacitors. The table compares one MLSH (2200 µF @ 40 Vdc) with a parallel bank of 4 x (1000 µF @ 40 Vdc) wet tantalum caps. The high temperature capacitance ( @ 125°C) of the wet tantalum bank is much higher but you can see that at -55°C, the roll-off in the wet tantalum capacitance is huge and measures less than the single MLSH capacitor. The single MLSH capacitor weighs less than four wet tantalums and its cost is roughly 50% of the wet tantalum solution.
The following graphs further illustrate the superior capacitance retention of the hermetic aluminum electrolytic technology. The first graph (to the left) shows capacitance change with frequency while temperature is held constant at -55°C. There is a lowering effect of capacitance as frequency is increased. The second graphs shows capacitance roll-off with frequency of four wet tantalum capacitors in parallel. The slope of the capacitance drop for the wet tantalum bank is much steeper. The third graph (to the right) is the ratio of the capacitance curves, i.e. the capacitance measured on one MLSH divided by the capacitance of the parallel bank of four wet tantalums across the entire frequency range. Where the ratio exceeds one (1), the MLSH solution has higher capacitance than the bank of 4 wet tantalum caps. Between the range of 100 Hz through 10 Khz, the single MLSH capacitance exceeds that of the four wet tantalum caps in parallel. At 1 KHz the MLSH capacitance is twice that of the parallel bank of 4 wet tantalum caps.
Other comparisons between type MLSH and wet tantalums follow:

- Many mil/aero application require performance over the full temperature range of -55°C to +125°C.
- Type MLSH hermetic aluminum electrolytic capacitors have a rated nameplate voltage at +125°C. There is no need to de-rate them for voltage. If fact, at lower temperatures, one can increase the applied voltage on the MLSH per the datasheet table as shown on a page (7).
- Wet tantalum capacitors have a nameplate voltage at 85°C. In order to use them at +125°C, wet tantalum capacitors must be de-rated by 33% of their 85°C rating.
- Hermetic aluminum electrolytic capacitors are available up to 250 Vdc at +125 Vdc. The maximum voltage for wet tantalum capacity technology is 85 Vdc at 125°C.
- For applications exceeding 85 Vdc @ 125°C, it is necessary to place wet tantalum capacitors in series to stand up to the voltage. When 2 capacitors of the same value are placed in series, the voltage capability doubles, but the capacitance is cut in half. That effect reduces the capacitance for bulk storage and it becomes necessary to use large series-parallel banks of wet tantalum capacitor to meet the applied voltage at +125°C and to get the capacitance needed at -55°C.
- From a manufacturing standpoint it simplifies board layout and reduces assembly costs going from multiple components to a single component.
- From a reliability standpoint, a single component solution enhances system reliability.
- Tantalum is a mined material that has been subjected to severe shortages. When shortages occur, price increases sharply and lead times are severely extended.
- Tantalum is also a conflict material which makes it undesirable from a social responsibility standpoint.
- These are some of the pain points associated with wet tantalum capacitors that our new hermetic aluminum capacitors are sure to alleviate.
For additional information on type MLSH Hermetic Aluminum Electrolytic Capacitors, we offer a link to the catalog datasheet.
Thank You!