

## **TECH SHEET**

### **PEM® – REF/Solderability Shelf life**

#### **Subject: Shelf life considerations for electro-plated bright tin or electro-plated matte tin plated fasteners**

Fasteners finished with electro-plated bright tin or electro-plated matte tin will experience some loss of solderability over time. The shelf life of any given lot of product varies with the characteristics of the tin plating and the storage environment.

Solderability of tin plating is degraded by two primary factors. The first is the oxidation on the surface of the tin plating. Second is growth in thickness of the intermetallic layer between the tin plating and the metal directly beneath it.

Oxidation on the surface of the tin plating typically begins very soon after the tin plating is applied. This is because "as plated" tin is very active and will readily and quickly react with air to form tin oxide. However, tin oxide is much less reactive. This process slows with time and typically stops completely in several months. This formation of oxide will measurably reduce solderability as measured by quantifiable means such as wetting time, but typically does not render the tin plating un-solderable. Humidity is the storage variable that has the greatest effect on tin oxidation. The higher the humidity level experienced by the parts during storage, the faster the tin plating will oxidize.

Growth of the intermetallic layer is a much slower process than surface oxidation, but unlike oxidation, it is not self limiting. The intermetallic layer will continue to grow in thickness until it reaches the surface of the tin. This growth has only a minor effect on solderability as long as this layer is thinner than the tin plating. However, when its thickness reaches the thickness of the tin plating, there will be a sudden and pronounced loss of solderability. Temperature is the storage variable that has the greatest effect on the rate of growth of the intermetallic layer. The higher the storage temperature, the faster the intermetallic layer will grow. The type of metal under the tin also affects the rate of growth of the intermetallic layer.

The length of time required for the intermetallic layer to grow to equal the tin plating thickness is a function of combined growth rate and plating thickness. For a given rate of growth, it will take twice as long for solderability to be significantly effected if the tin plating thickness is 5 microns (.0002 inch) instead of only 2.5 microns (.0001 inch).

Typical solderable shelf life of products using these finishes is 12 to 18 months (depending on the product) from the date of the original packaging. In order to maximize the shelf life and solderability of these products it is recommended that:

- Product remains in original packaging (with desiccant) or equivalent repackaging supplied by an authorized distributor.
- Storage temperature should be maintained between 5 and 40 °C (41 to 104 °F)
- Relative humidity should not exceed 80 %

If you have a question about the viability of electro-plated bright tin or electro-plated matte tin product in your inventory, contact the supplier.