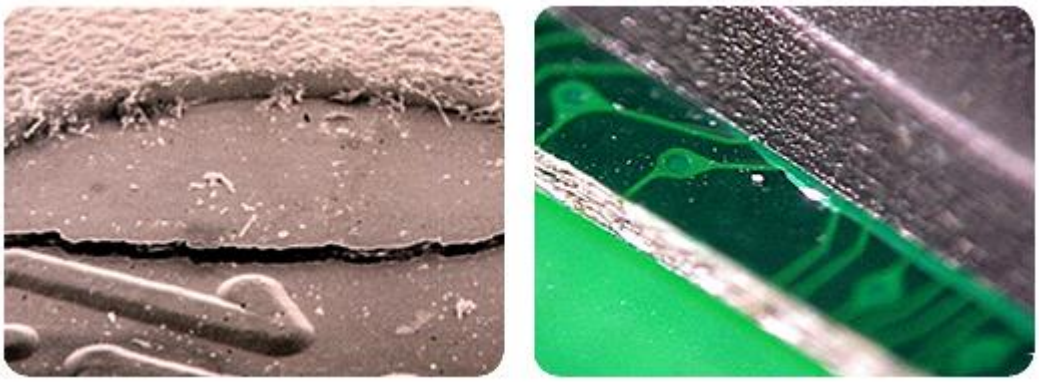
Solutions for long-term storage of electronic components and compositions.

The storage of electronic components and compositions is problematic, and increasingly so as the result of two issues.

1. Due to rapid changes in packaging design and material, many companies find themselves forced to purchase additional quantities of components in order to guard against the impact of component obsolescence on their final product designs. This in turn creates an issue of long term inventory storage

2. Product lifecycles have become very short with new models being released sooner than ever before. However, many manufacturers, such as automobile suppliers, must guarantee the availability of replacement parts including PCBs for up to ten years. This situation also necessitates the advance purchase and extended storage of components and materials. Further complicating the problem is that most components cannot be stored for more than 10 years without very special handling procedures.



Component micro-cracking resulting from the absorption and rapid release of moisture

The biggest danger posed is humidity. It is the cause of two of the biggest defect causes: **Oxidation and Diffusion.**

Because of surface oxidation, components and PCB's can suffer from reduced solderablity, which often results in complete failure. Diffusion of vapor and noxious substances in the inner structure of the components or PCB's can result in long-term disintegration of conductor paths and insulation layers. Both risks can be avoided by correct handling and dry storage.

The oxidation process - contact corrosion
In an ultra-dry atmosphere there is no corrosion. For corrosion to occur, two demands must be met: there must be a means of oxidation and a watery solution, which works as an electrolyte.
The oxygen in the air forms the means of oxidation, the vapour (humidity) the electrolyte.

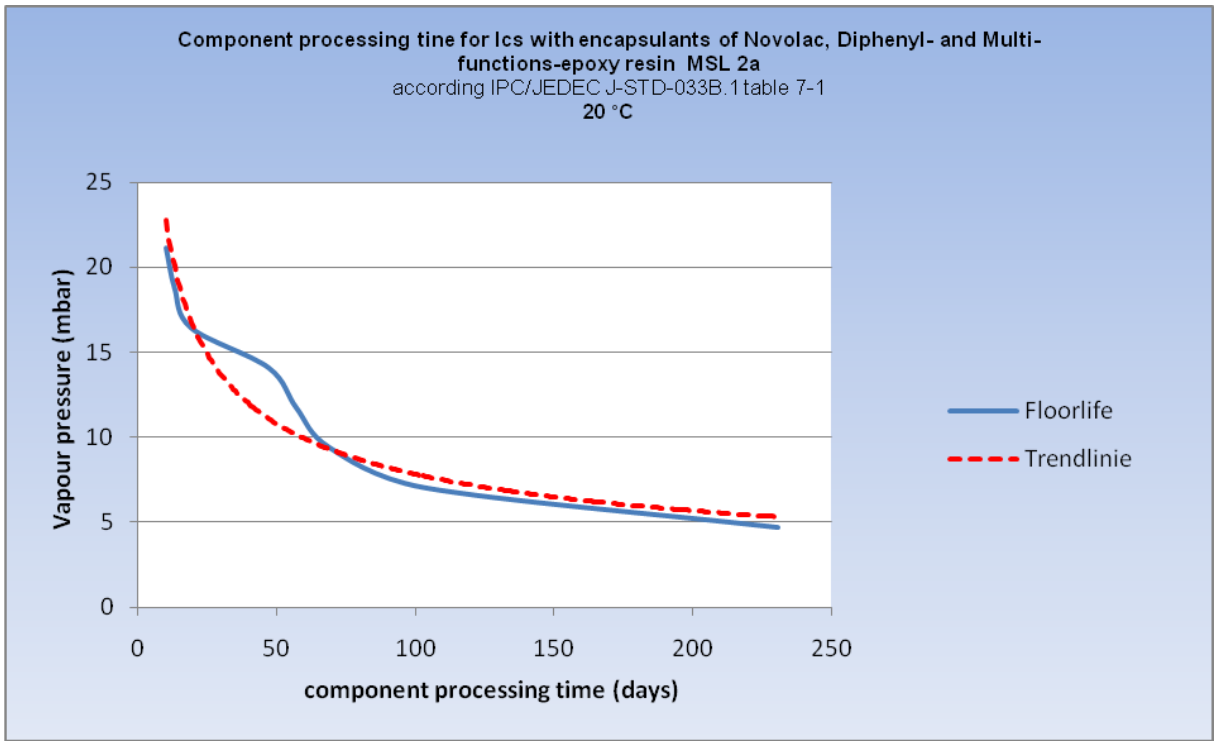
The critical limit at which oxidation with oxygen takes place lies in accordance with the metal or alloy at between 40 to 70 % RH. This means that more than 8 grams of vapour per m^3 must be present.

Solution 1: Dry storage cabinet
The absolute humidity in a dry storage cabinet lies at a temperature of 20 °C and <2% RH with less than 0.35 g/m^3.Under these conditions no cathode reaction is present and thus no oxidation can take place.

Solution 2: Moisture Barrier Bags
In humidity protection bags packed under vacuum with a rest pressure of ca. 6 mbar there will be between 0.1 and 0.06 g vapour per m^3. When the bags are filled with nitrogen, neither a means of oxidation, nor an electrolyte are available, and oxidation is impossible.

The Diffusion process

The vapor in the atmosphere diffuses into hygroscopic materials. The cause of this is the so called vapor pressure - this means the partial pressure of the vapor which is present in the air. The higher the vapor pressure, the faster the components or PCB's absorb humidity and with this the permissible processing time decreases.



All components classes 2a to 5a in accordance with the classification of IPC/JEDEC J-STD020D absorb no moisture with a vapour pressure of < 2.82. At this level they can be stored and processed indefinitely. (see IPC/JEDEC-STD033C table 7-1).

Super Dry® Storage Cabinets maintain over 24 hours on average a vapor pressure of < 0.95 mbar. In a humidity protection bag with a rest pressure of < 6 mbar the vapour pressure is < 0.15 mbar.

Both systems, dry storage cabinet and humidity protection bag, reliably and effectively protect from moisture diffusion.

For storage periods of more than 5 years, a combination of the two systems is recommended. The storage in humidity protection bags with nitrogen present within a simple dry storage cabinet with 5 % RH.

Critical to the effectiveness of the bags, however, is that the construction is mechanically stable and exhibits a very low percentage of diffusion. The IPC/JEDEC-STD033B.1 demands a Moisture Vapour Transmission Rate (MVTR) of less than 0.002 g/100 in² in 24 hours at 40 °C. This demand is only met by bags which have a thickness of 150 µm. 90µm-bags have a substantially higher diffusion percentage and are therefore not suitable. Totech Moisture Barrier Bags remain significantly below the maximum value as laid down in the IPC standard with an MVTR of 0.0006 g/100 in².

The bags must of course also be ESD-safe; they must be marked as receptive to humidity and be provided with a label upon which the Moisture-Sensitivity-Level and the packing date are clear. As an additional convenience, Totech bags include pre-printed labels.

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