Long-term conservation of electronic components

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Procurement managers and developers are aware of the problem: as early as during the development stage or shortly after launching a product, a single component of an electronic assembly becomes obsolete, and decisions regarding how to proceed have to be made. Should a redesign be performed? Or should an LTB (Last-Time-Buy) ensure the availability of the required parts until their discontinuation or at least until the next PCN (Product Change Notification), in order to directly replace several obsolete components?

The issue with discontinued products is currently escalating due to the increasing number of huge semiconductor manufacturers that are merging. Unprofitable or redundant product lines are terminated on short notice, and provident, proactive or strategic obsolescence management within the company proves to be difficult. Even the method of storing the required components involves underestimated risks since only a qualified storage concept – tailored especially for the components – ensures functionality and processability after a storage period of several years.

Many times, companies have already reacted to these issues and established a division responsible for coordinating obsolescence topics. Reasonably, this department should report to management, as an efficient and useful solution can only be achieved by a superior, inter-divisional authority.

To prevent as well as process obsolescence issues, the development, quality management and purchasing departments should collaborate. It is essential to specify the components, if possible, according to the availability of a second source and the likelihood of a discontinuation. With the help of appropriate tools, an estimated availability is assessable.

However, even with precise, proactive and strategic obsolescence management, the need for a Last-Time-Buy cannot be avoided completely. The appropriate and qualified long-term storage of these components, in order to eliminate risks through poor functionality or processability, is more important. The commonly held opinion that storage in nitrogen dry packs stops the aging process is wrong! Oxidation is reduced exclusively with nitrogen; however, in the standard packing process, so-called nitrogen dry packs still reveal percentages of oxygen. Accordingly, the effectiveness of the reduced oxidation is in question. The relevant aging processes, such as diffusion or corrosion processes caused by outgassing of hazardous substances, will not be minimized at all.

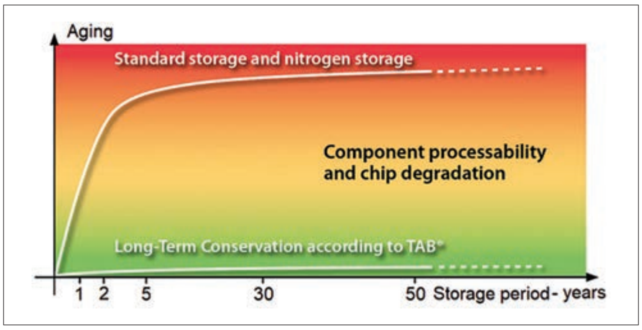

Fig. 1 Component aging subject to storage methods

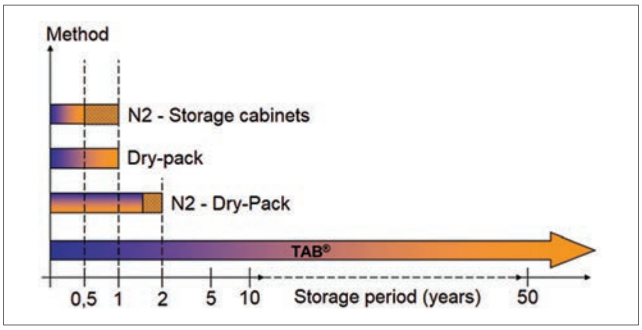

Fig. 2 TAB® method diagram. Generally, most of the material changes (70-80 %) have already taken place in the first two years during normal storage. Therefore, components which do not immediately come into operation should be stored as soon as possible according to the TAB® procedure, in order to enable a long component life!

The TAB® procedure as a resolution of the issue

To ensure the long-term availability of electronic components, HTV developed more than 15 years ago the **TAB® procedure (Thermal Absorptive-Gas Barrier)**, unique in the world, in order to provide electronic components with the required quality.

This enables long-term storage of electronic components and assemblies for up to 50 years by reducing decisive physico-chemical aging processes. These already affect processability and functionality in conventional storage after 1-2 years.

As one of the global market leaders in testing, component programming, long-term conservation and storage, as well as analytics and component processing of electronic components, the HTV Group has invested their experience of more than 30 years in the development, specialization and continuous optimization of special long-term conservation.

Effectiveness of the TAB® procedure

TAB® permits the long-term prevention of corrosion and oxidation processes based on special absorption systems (humidity, oxygen and hazardous substances, dependent on material). The aging processes inside the component (diffusion at the chip level), as well as material migration at the chip level and pin level, will be greatly minimized via TAB®.

Moreover, the risk of whisker formation (tiny tin needles that grow out of the material and could lead to short circuits on printed circuit boards or single devices) and tin pest is controlled.

The growth of intermetallic compounds (diffusion process), for instance between the external tin coating and the base material of the pins, can be nearly stopped, along with the aging due to diffusion processes at the chip level, one of the most significant aging processes.

In this way, the quality, processability, functionality and ultimately the availability of electronic component spare parts can be ensured for several decades.

High-security buildings, characterized by reinforced concrete construction, a specific fire-prevention atmosphere and a sophisticated monitoring system with alarms and cameras, provide optimized storage conditions, as well as protection against burglary and natural disasters.

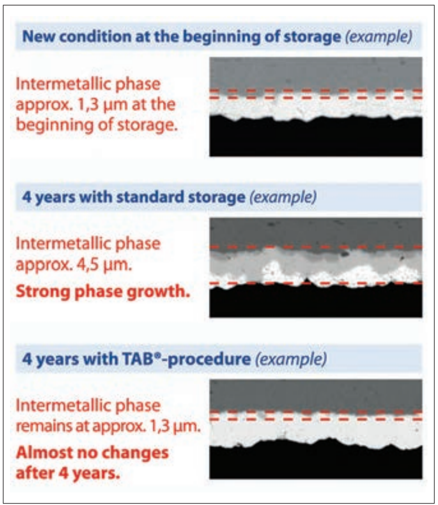

Fig. 3 Whereas in the case of standard storage an increase of approx. 1 µm is detectable in the intermetallic compound, according to TAB®, phase growth during storage can hardly be ascertained.

Fig. 4 Storage in climatic chambers at the HTV high-security building

Conclusion:

With TAB® therefore, the gap in provision caused by the insufficient availability of spare parts can be proactively closed. Discontinuations of spare parts lose their urgency and enormous expenses can be saved.

TAB® de facto – long-term storage of displays

TAB® long-term storage is of particular importance for displays, probably one of the most rapidly growing markets, since for many display components, e.g. various polarization foils, conventional storage can be seen as very critical. Generally, little information is provided by the manufacturers regarding long-term storage or aging. However, indications in the datasheets imply a maximum storage period of 1-2 years.

The displays should be stored in the dark – not exposed to sunlight – with the temperature between 0 and 35°C and low relative humidity.

Storage in extended temperature ranges (+60 or +80°C) results in a diminution of the contrast, while storage in lower temperature ranges tends to result in a marginal enhancement of the contrast.

Further aging processes include, among other things, the temperature-related degradation of the adhesion of the plastic components as well as the OLEDs and the modification of liquid crystal (LC) mixtures, which leads to a change in the LCs' flexibility and thus a change in the response time and contrast.

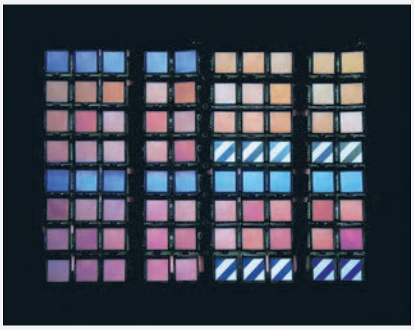

Fig. 1 Energization of displays

With HTV's TAB® long-term conservation, even these aging processes are decreased drastically through special storage conditions.

After documentation of the initial state (such as topography, microscopy, sealings, and contrast measurement, for example) and, if required, sorting of damaged or defective goods, storage will take place with special packaging in chambers – developed specifically for this purpose – with previously defined temperature ranges and specially configured absorbers of hazardous substances.

Frequent operation (energization) and cyclic analytics for sample tests of possible aging processes complete TAB® long-term conservation and ensure the functionality and processability of the displays for many years.