OSP = Organic Surface Protection =
for Printed Circuit Boards
A Question of Continental Preference

The answer to the lead-free problem could sound this simple: Immerse a printed circuit board into a solution, and the result is a final surface that can be stored and soldered. In fact, such a thing does exist: a lead-free alternative to HAL (Hot Air Levelling) with these wonderful features, at least from the point of view of the PCB manufacturer. OSP is an organic solution based on an imidazole substitute which, by means of dipping or rinsing can be selectively applied to the copper surfaces, ready for soldering. A transparent layer, max. 0.2 to 0.6 my thick, covers the copper like a barely visible clear varnish.

Completely level thanks to direct contact with the copper

Purely as a sealing agent, OSP offers good preconditions to adhere components that require an absolutely level surface, thanks to the fact that the soldering paste is applied directly to the copper. The common problem of twisted fine-pitch components due to raised "tin bubbles" on the HAL surface is, therefore, a thing of the past. The impress technique can be more precise with OSP, if one considers how much firmer the copper is because of its direct contact with the component. The varnish forms an airtight cover to the copper surface and "allows" the processed boards a storage life of 6 months maximum. Increasingly, after this time, the encapsulated surface protection characteristic is gradually lost. A copper diffusion, as is the case with chemical tin, for instance, does not occur.

Should there be soldering problems due to processing errors, "de-wetting" or other faulty soldering points can be seen immediately, thanks to clear demarcation to the copper. However, the most important argument in favour of OSP is its price: in contrast to other lead-free alternatives with their complicated electrolytic or chemical procedures, OSP is basically just a one-step process. Chemical tin, chemical silver and chemical nickel-gold are therefore, far more expensive; HAL only marginally so.

Doubts– just a European attitude?

So, what are the disadvantages ? European users, in particular, can list quite a few: the predominant one being, that for mixed components and other multi-thermic processes, the organic protection layer breaks off at temperatures above 150˚ C . All in all, the area of use for soldering at higher melting temperatures has not yet been reliably tested. In addition, OSP does not bond.

The ability to bond with soldering paste – in particular with lead-free soldering paste – depends greatly on the soldering procedure, such as convection ovens with or without a nitrogen atmosphere, high cooker ovens, etc Tests so far show that bonding is not as good as with the other named surfaces. Therefore, the self-centralising effect is noticeably lower and requires greater precision of solder paste pressure. In addition, the test for soldering ability showed that emphasis should be placed on a suitable flux agent, as this, in addition to the thermic effect, also leads to the removal of the OSP layer.

In Europe, there is a lack of enthusiasm for OSP, especially due to the great demands made on the flexibility of lead-free surfaces, plus the need for multi-soldering using a variety of thermic processes with standard flux agents.

Different Industrial Structures – Different Surfaces

It is, therefore, not surprising that, especially in Asia, OSP is as popular as chemical tin is in Europe, or chemical silver in the US. An environment of mass production with long-term planning – often in-house – using a single thermic soldering process makes OSP the absolute favourite.

As long as Europe is oriented towards flexible, small series equipment with a variety of special technical requirements, OSP will remain an alternative niche.

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