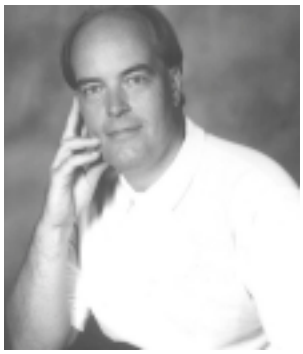
Solderability Testing of Printed Circuit Boards - For Free

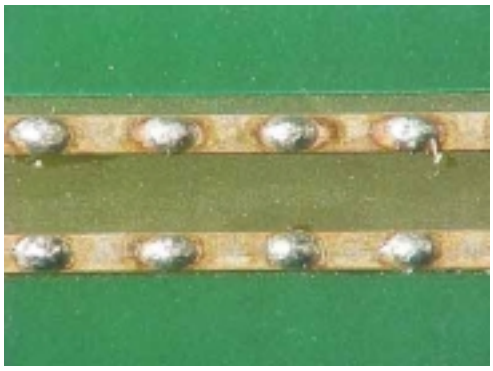


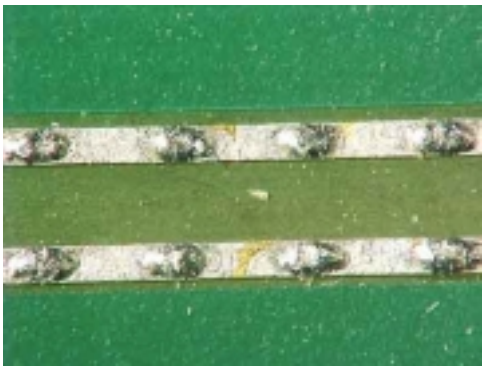
With the increasing use of alternative Printed Circuit Board (PCB) solder finishes being used in the industry we must consider the quality and the long term life of these protective coatings. Monitoring the degree to which they wet and the variation from batch to batch of PCBs can be important. Allowing simple solderability testing on every board can be beneficial in production.

Using permanent wetting test patterns can be simple and eliminate the need for costly test equipment. It is easy to build up a library of data which can be compared with changes in production profiles, new pastes and other process changes. The test method can be used to compare the degree of wetting between tin/lead and lead-free alloys which may be an issue which engineers are forced to deal with in the next couple of years.

By simply adding a group of parallel lines on scrap areas of the circuit board or on an open area of the board, testing can be conducted on every board produced. It is also possible to select sample boards at goods receipt, if required to check solderability using a true production environment and the intended combination of materials.

If you place two or three parallel tracks as shown in the examples and reflow paste on the tracks a direct assessment can be made on the amount of flow along the tracks. The production stencil would feature rows of square or circular apertures which will deposit paste during production printing. After complete assembly and reflow the number of paste dots that coalesce together is an indication of the degree of wetting. In the example the tracks used were 0.015" /0.380mm wide and 1.0" /25mm long with an open 0.070" /1.8mm block resist opening. The stencil aperture used in the example was a 0.020" /0.5mm square.





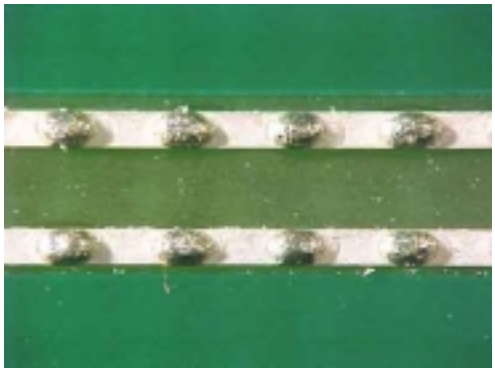


Figure 1, 2, 3 show the differences between the wetting test on silver, copper OSP and gold. The coatings have become popular over the last few years but the coating consistency is the real issue to assembly engineers.

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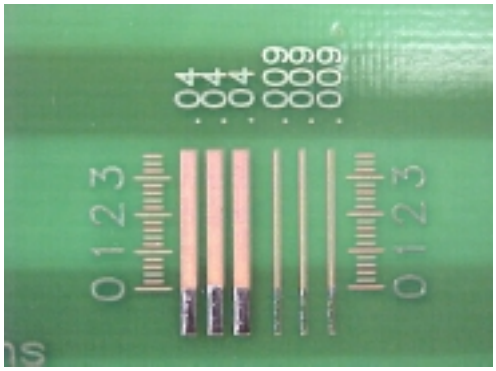

Figure 4 shows an alternative wetting test pattern used by one company, it can actually determine the distance of wetting. The correct combination of paste and paste volume is the key to making the test successful.

It is perfectly feasible to do the same trial selectively using a mini stencil and only print and reflow the test site. This allows the boards still to be used in production but indicate the integrity of the surface finish when received. This exercise can be used to illustrate the effect of multiple temperature excursions, printed board wash off, adhesive cleaning or curing. The solderability of the sample circuit board should be only marginally affected if pre-tested, provided of course the quality of the coating was sound in the first place. As most alternative coatings are designed for multiple exposures to heat, solderability of a good coating should still be maintained.

This test method has been used on two production lines running lead-free alloys. The test board feature was used with OSP, silver, tin/lead and gold with tin/silver/copper solder paste. The results provided confidence in the simple test to show up solderability problems prior to production. It was also able to show the effects of single and double reflow exposures and cleaning operations on boards due to a washoff of solder paste.

Similar test patterns have been featured on boards produced by National Physical Laboratory (NPL) for some of their programmes. As yet there is no direct comparison with existing solderability standards but that may not ever be achievable based on the years to develop standards based on the wetting balance.

Bob Willis is a process engineer providing engineering support in conventional and surface mount assembly processes. He runs production lines for suppliers at exhibitions and also provides seminar and workshops world wide. Bob has one of the largest collection of training videos, interactive CD-ROMs and training material in the industry. Bob will be presenting four Master Classes at APEX in California, he will also be presenting classes at SMT Nuremberg in Germany for those engineers visiting the show. For further information on how Bob may be able to support your staff contact him via his web site **www.bobwillis.co.uk**