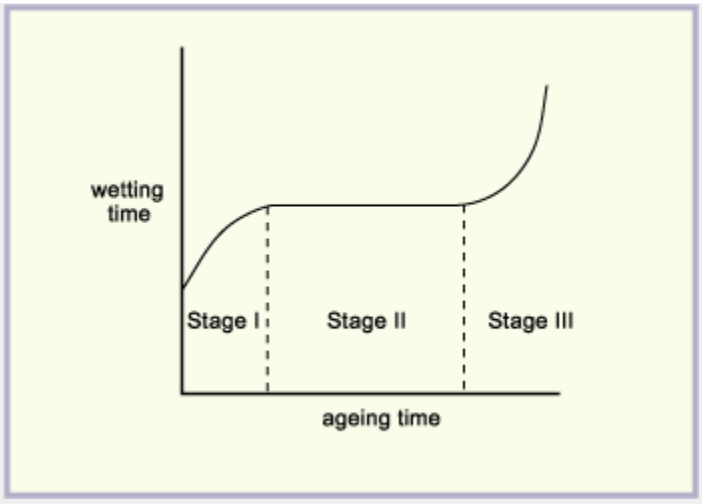
Changes in Solderability with Time

Component solderability is extremely variable, depending on the type of material and the conditions in which it has been manufactured and stored. Damp and heat combined will do much to reduce the wettability of even the more robust surface. The deterioration with time of the solderability of a tin-lead coated surface is shown schematically in Figure 1.

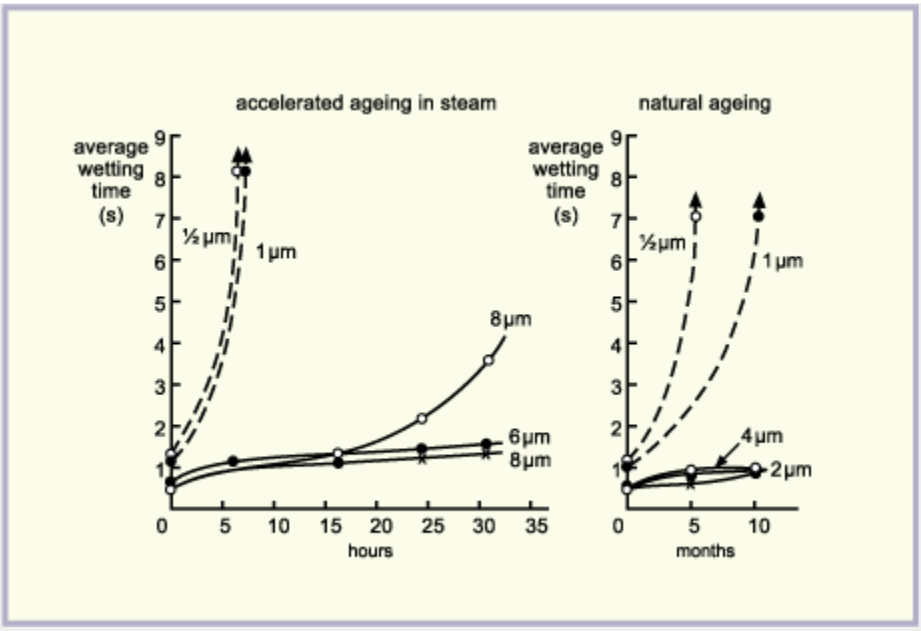
Figure 1: Schematic diagram of the wetting time of a solderable surface area as it ages



During Stage I an oxide coating develops and solderability deteriorates: during Stage II, the wetting time stays constant, although the oxide continues to grow. The explanation proposed is that unsolderable oxide coatings are broken up by the flux action (rather than reduced to the metals) and then float away from the soldering site. The surface becomes unsolderable (stage III) once the oxide has become thick enough to prevent this happening.

Figure 2 relates the thickness of solderable coatings to their deterioration with time, which demonstrates the benefits of a thick coating.

Figure 2: Wetting time vs ageing time for different coating thicknesses



As you would expect, given the fact that steam ageing accelerates effects that are found naturally in life, this technique has been used to demonstrate the ability of coatings to withstand atmospheric conditions. One would hope for good correlation between the performance of samples aged in steam and those that have been ‘shelf-aged’. However, always take care when placing too much confidence in any technique:

- Romm has criticised steam ageing as a means of evaluating the long-term performance of nickel-palladium finished lead frames, on the grounds that it inordinately affects the solderability test performance
- Another ageing test performed in the electronics industry in order to simulate the long storage of process to boards is to carry out a 4-hour anneal at 155°C, intended to substitute for

one year of storage at room temperature. Lamprecht criticises this test because it builds up a thicker layer of intermetallic compounds, and suggests that it is better to subject the parts to three reflow processes.

The wetting balance test deliberately uses a minimum amount of flux, in fact the mildest flux available. This is not necessarily representative of the performance of real products, where a more active flux may be available. As a designer, you need to know something of the materials used by your assembler, because there may be incompatibilities between certain combinations of fluxes and coatings. For example, Electrochemicals report that not all no-clean fluxes may be compatible with OSP coatings.

Source : http://www.ami.ac.uk/courses/topics/0150_cwst/index.html