IMPLEMENTING NO-RESIDUE™ TECHNOLOGY

By

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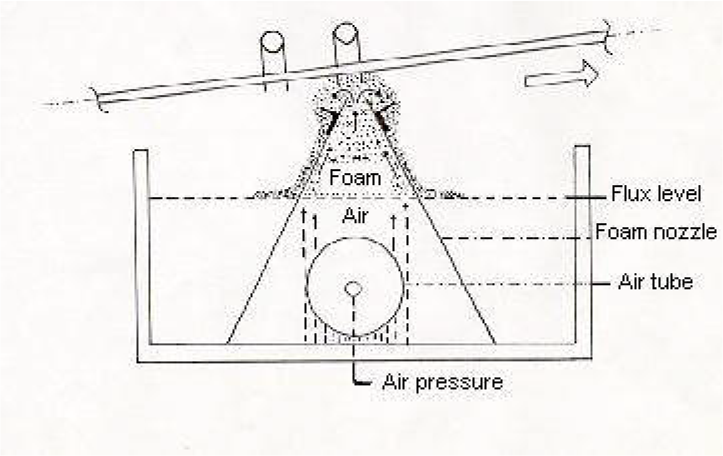
IF2005Mz flux is the chemical part of the No-Residue™ Technology. It is a blend of solvents containing oxide reducing agents. Each solvent by design, aids in the proper wetting of the PWA and in spreading the oxide reducing agents into a fine crystalline network. Each solvent by design, will volatize at a specific temperature resulting in the basis for No-Residue™ Technology. IF2005Mz has over a decade production history. IF2005Mz is applied using conventional equipment and is controllable by density. This product offers the largest process window compared to other No-Clean type (low solids) fluxes, however thermal profiles and wave dynamics must be adjusted in order to achieve optimum performance. The next paragraphs will address all important parameters to insure residue free boards.

FOAM FLUXING

Foam fluxing is the most common method of applying flux. Flux chimneys utilizing rosin flux had a wide opening on the top. Because IF2005Mz does not contain rosin or any synthetic bodies a different design of the flux chimney is required in order to consistently perform well. The optimum design should be an 'A-frame" with a top opening of ¼" but not more than ½". Because IF2005Mz has such excellent wetting capabilities, only minimal contact with the flux is required. The use of a high density air stone (20 micron) will produce a high density stable foam head. Air stones of 1" to 2" in diameter are ideal. Air pressure of 15-20 PSI with 25 to 50 L/min. volume depending on the height and length of the foam nozzle is required. The flux level should be at least 1.2"above the top of the flux stone. Adjust the air pressure to create a stable foam head. To create proper contact between the board and the flux, raise or lower the flux station only. Never start up a foam fluxer without the presence of an air knife.



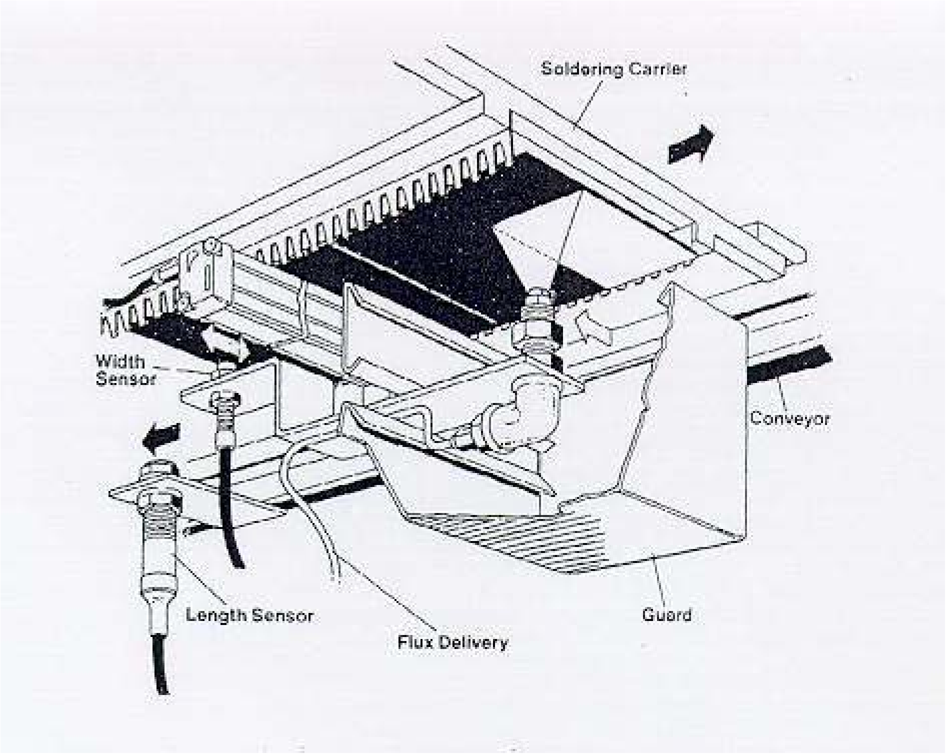
AIR KNIFE

The use of an air knife is imperative with IF2005Mz. The function of the air knife is to remove flux droplets and excess flux from the PWA. The droplets, if not removed, will change the proper evaporation rate of the flux solvents and may be left on the solder side as white residue. The angle of the air knife should be 10° reverse to the travel of the PWA. The distance between the air knife and the foam fluxer should be at least 4 inches. This will insure that the air does not interfere with the stability of the foam head. The distance between the air knife and the board should be approximately 1½ inches. The air pressure should be adjusted in such way to remove excess flux without pushing the flux through the holes onto the topside of the board. Always try to remove excess flux back into the flux pot.

SPRAY FLUXING

Spray fluxing is considered the fluxing application of the future. When set-up properly, the spray fluxer provide a uniform coating of flux onto the board surface and greatly reduce the consumption of flux used in the process. Because there is no physical contact between the board and the flux in the reservoir, flux contamination is eliminated. In a drum spray fluxer the angle of the air knife must be changed so that it is vertical (± 1°) to the travel of the board. The reason for this set-up is to avoid the shadow effect on SMD boards and to improve wetting in plated through-hole boards. Always check the spray pattern with a piece of cardboard, as this will give a good indication of the volume and the coverage. To overcome the fire hazard created when sprayed in a heated environment, a spray fluxer should be built as a separate unit

Example of jet spray moving nozzle

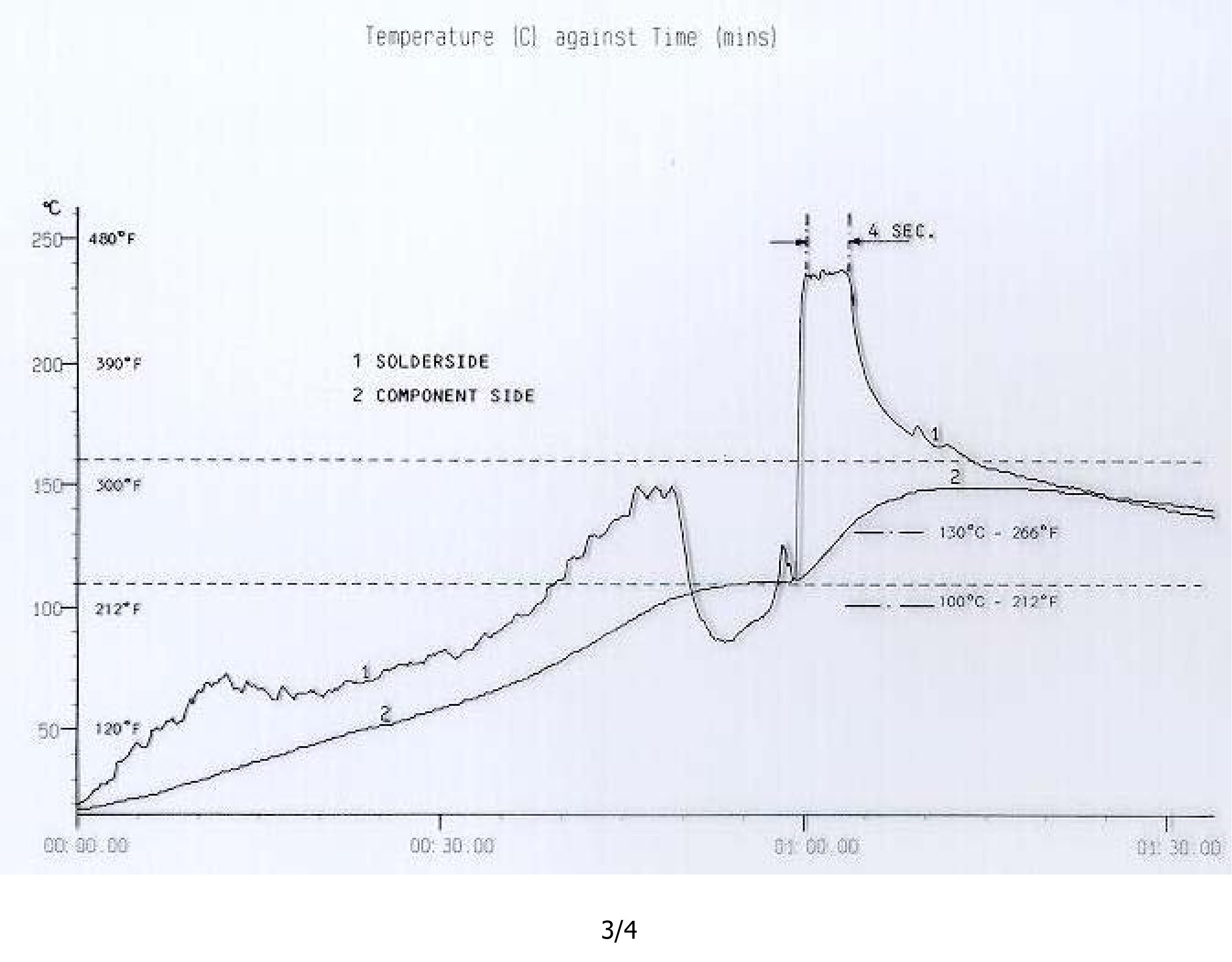


PREHEATING

As previously stated, IF2005Mz is a blend of solvents which contain oxide reducing agents. Each solvent by design, aids in the proper wetting of the PWA and in spreading the oxide reducing agents into a fine crystalline network. Each solvent by design, will volatize at a specific temperature resulting in the basics for No-Residue™ Technology. The ideal heat curve for IF2005Mz flux must be progressive in energy (heat). The first low energy stage allows the different solvent to volatize in the proper order. Because each solvent has its function and its own volatilizing temperature, this gradual heating curve will allow each solvent to function in the proper sequence. If we heat the board to fast, we risk boiling the solvents up onto the component side of the board. This first heating phase is called the SOLVENT ACTION ZONE and the topside temperature of the board should increase gradually from 0 to 104°F in this zone. Forced convention enhances the results of this first phase.

The second heating phase should increase the energy (heat) into the board so that the topside temperature (prior to entering the wave) of a conventional PTH board will be 230°F. For SMT or mixed technology boards the topside temperature should be increased to 266°F. The second heating phase is called ACTIVATION ZONE. It is during this phase that the active parts of the flux react with the oxides. Through the use of temperature sensitive labels, IR camera or thermo profiler these temperature can be checked. As the boards passes through the wave, you should hear little to no sizzle. If you hear a lot of sizzle, you have not conditioned the flux properly.

Temperature Profile



WAVE DYNAMICS

With rosin fluxes and organic acid fluxes, oxides resulting from the cleaning action of the flux were encapsulated in the flux bodies and were removed during the cleaning process. Because IF2005Mz does not contain any of these bodies, the oxides must be removed using proper wave dynamics. The solder wave should be adjusted so as to have a dead zone at least 1" from the back adjustment plate of the solder nozzle. The solder in the dead zone should have little to no movement in either direction. Next check the immersion depth of the board in the wave. To insure correct heat transfer from the bottom to the top, the board should be immersed in the solder wave as deeply as possible without flooding the topside of the board. Next take a 4 inch spatula and try to block the front flow of the solder wave. Preferably, you should have to exert pressure to accomplish the blocking. Front flow pressure of the solder wave is important. The front flow pressure is the force of the solder wave moving in opposite direction of the board. As the PWA makes contact with the wave, the top layer of solder should stop flowing reverse to the travel of the board. The oxides in the dead zone should begin to move in the same direction of travel as the board and at the same speed. If you stop the board on the wave, the oxides should also stop moving. Once you have established these dynamics, your board will exit the solder wave in the dead zone and this will reduce the possibility of solder shorts. Next check these dynamics with a glass plate or level check. Always flux the glass plate prior the checking the wave dynamics. Dwell time in the solder wave should be at least 4 seconds @ 500°F to provide proper heat transfer to the topside of the board. A quick check is to place some IF2005Mz on the topside of the board. Observe the board as it exits the wave. If you have proper heat transfer, the white residue will volatize as the board exits the solder wave.