Vitronics Soltec

By G. Schouten

Comparison between foam fluxing and spray fluxing

Information Sheet 039

Related documents:
Information Sheet 038 about flux penetration in connectors or relays.

Foam fluxing

For foam fluxing the flux must have a solid content of at least 5%.
If a flux has less than 5% solids, the foam formation becomes very unstable.
To improve the foam formation of low solid fluxes, often a foaming agent is added by the flux supplier to such fluxes, but still foaming may be difficult.
Water absorption and small traces of oil from the air supply may make foaming almost impossible in case of the use of low solid fluxes.
So it is very important to guarantee a clean air supply for the fluxer.

With a foam fluxer the amount of flux applied to a PCB is uncontrolled, but mostly more than sufficient.
This may be a drawback in case the amount of flux must be well controlled, as for most low solid fluxes, to guarantee the save behaviour of the flux residues under severe climatic conditions.

An other drawback of the foam fluxer is its sensitivity to pallets or boards which have a higher temperature than the ambient.
In this case the foam crest will collapse when such a board or pallet is passing over it and the flux application will be unpredictable.

With a foam fluxer normally the flux will automatically give a good penetration in the holes by capillary action.
This may even give flux to the component side, which than can penetrate in "open" components such as relays or connectors. (see also IS 038).
The drawback of this strong capillary penetrating force, in case of soldering SMD's on the solder side, is that flux will be encapsulated under these SMD's, which can lead to skipped joints.
The flux underneath these components will continue to evaporate when the board is in the solder wave, so the solder is unable to reach the joint area.

Since the foam is flushing the underside of the board, particles adhering to the board may drop into the fluxer.
This will give flux contamination, since these particles will collect in the fluxer.
For this reason the fluxer must be cleaned at regular intervals and the flux must be replaced.
Under no circumstances the fluxer aerator stone may dry out, so if the flux is drained off the aerator should be stored under solvent.
The drained flux must be treated as chemical waste.

The air which is continuously flowing through the flux, will evaporate the solvent from the flux and will also oxidise the flux.
This may also be a reason to change the flux at regular intervals.

Since the density of the flux and the solvent for low solid fluxes are almost of the same value, the automatic flux density control system can often not work properly

to give a correct solvent supply to compensate for the evaporated solvent.
More over, water absorption in the flux will change the density considerably, which may give incorrect solvent addition, in case an automatic flux density control system is used.

Spray fluxing

With a (drum)sprayfluxer it is possible to apply an exact amount of flux to the board.
The flux application can be precisely regulated by the rotation speed of the spray drum and the transport speed of the board over the spray fluxer.
The air pressure on the blow pipe under the rotating drum should be set between 3 and 6 Bar, so that all the flux is applied to the board and that there is no reflection of the flux from the board.
This flux reflection can happen if too much air pressure is used.
The air supply is only activated via a tracking system if the board is passing over the fluxer.
With a spray fluxer there is no risk of flux contamination, since the flux which is contacting the board will not return in the fluxing unit again, as is the case when a foam fluxer is used.

For a given type of flux the setting of the system is very reproducible, which means that at the same setting one always applies the same amount of flux.
Since different fluxes may have different viscosities and densities, the amount may be not the same for different fluxes at the same setting.
For colophony fluxes with a density higher than 0.82 g/ml, the flux viscosity may be too high to give a reproducible result, so in general the spray fluxer is not recommended for such fluxes.

The evaporation of the solvent from the flux can be reduced by using a automatic cover over the fluxer.
This cover will only be opened when a board is passing over the fluxer.
For low solid fluxes the by-pass flow through the blowpipe has no use and should there fore be closed to reduce solvent evaporation.
During the spray action also some solvent may evaporate.
This will cause an increase in flux density.
But since the flux consumption is automatically compensated by the automatic flux supply, the total loss of solvent due to evaporation will be limited and may still keep the flux well within the flux specification given in the suppliers data sheet.
In that case the system can be treated as a one way system.
This means that there is no need to compensate for the loss of solvent and that there is no extra maintenance or loss of flux as waste.
It is than also not necessary to add solvent to the flux.

Since the single flux droplets that are applied to the PCB will not penetrate into the holes in the board, it may be necessary in case of soldering boards with PTH's and to give good solder filling, to apply more flux to the board to give a complete wet flux layer, so that the flux can come in the holes by capillary action.
This is also, depending on the type of flux.
A good flux should be so mobile, that when the board enters the wave, it would enter the hole by the washing action of the solderwave, before the solder comes in the hole, even when a thin flux layer is applied.

Flux consumption

It is difficult to predict the flux consumption for a given application, since the amount of flux needed to do the job properly is depending on flux type and board type.
We can only say that with a spray fluxer one can bring a controlled amount of flux to the board in a reproducible way.
With a spray fluxer there is no waste of flux and often one does not need flux thinner or solvent to keep the flux within its specification.