

# (N)ow (Y)ou (K)now

Knowledge Sharing

The **Now You Know**, aka **NYK**, series is written to help spread the collective knowledge that has been accumulating on subjects that today's process engineers need to know.

## Using Over Pressure for Void-Free Solder Reflow

### **Abstract**

As electronic devices are operating at ever higher power densities, thermal conductivity becomes more of an issue. Modern eutectic alloys make the transference of heat much better but if there is excessive voiding at the thermal interface (TIM) that advantage may be lost.

The challenge is to find ways to adjust process parameters to address the issue of TIM voiding. By adjusting the atmospheric conditions, during reflow, you can help reduce or possibly nearly eliminate voiding.

### **Problem**

One of the functions of the eutectic solder used between devices and substrates is to thermally conduct excess heat away from your device. Even after you have cleaned all of your materials and dealt with the buildup of oxides, you still end up with voids in your solder joint. You have adjusted temperatures and time and you still have excess voids.

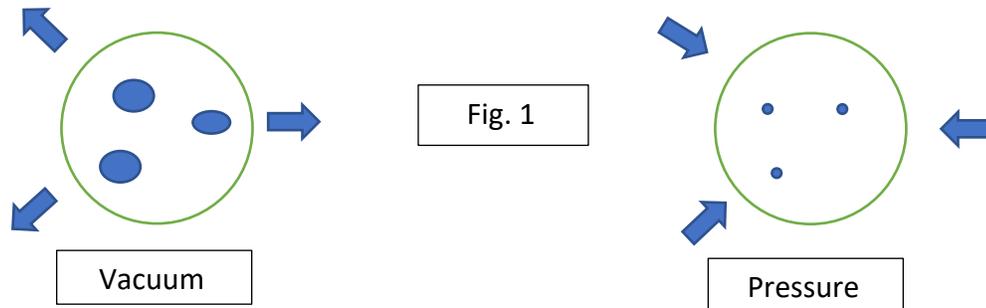
### **Solution**

One way to help reduce voids is to use over-pressure and employ the pressure variation method. This method is based Boyle's law which shows that volume (V) if a gas is directly proportional to the pressure (P) exerted on it. Stated as

$$P_1V_1 = P_2V_2$$

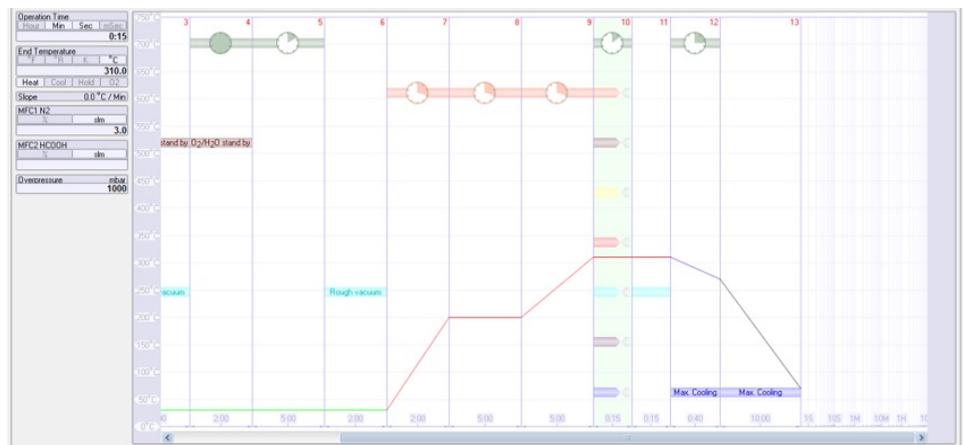
In practical terms this would mean that the larger the delta between the starting pressure ( $P_1$ ) and the final pressure ( $P_2$ ) the lower the voiding %.

Another way to describe this is to envision a bubble of gas inside a liquid under vacuum. The lower the pressure (higher the vacuum) the larger that bubble would be because the pressure on it is low. If you were to compress that liquid the gas volume will decrease, and the pressure will increase. (Fig. 1)



### What is the process?

Using the ATV SRO-7xx series, vacuum furnace, you would program the normal vacuum/purge cycles. Then program any other cycles, such as formic acid or preheat. As you reach the reflow temperature you would have the system initiate over-pressure, with nitrogen, up to 4 bar of pressure. Then as the reflow is complete you would then turn off the over pressure and introduce a vacuum. This pressure differential will help eliminate voiding that is caused by trapped gas.



### More Information

Contact [Sales@BSETPLASMAS.com](mailto:Sales@BSETPLASMAS.com)

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