

### **Automatic Oxygen Controller Improves Efficiency of Ultrasonic Atomising of Solder Powder**

In the past most industrial solder pastes were made using oxidised powder produced by simple air atomisation. Pressure to improve the control of the size range of solder pastes, and to avoid the use of corrosive halide fluxes, has led to a demand for lower oxide levels. In addition increased use of automated application systems and has led to much more critical specifications for paste rheology and stability in storage. In turn, this leads to a demand for a smaller maximum particle size, with limits on fines, especially super-fines (e.g. sub 20 microns)

Resulting from these pressures, **ultrasonically atomised powder** is ideal for this growing market. Ultrasonically atomised powder can offer:

- **almost zero fines sub 20 microns**
- **very high yields sub 100 microns**
- **ultra-low oxygen content**
- **spherical shape**

The marketplace requires a spread of powder sizes, with premium prices paid for good quality powder of 50-70 microns. The challenge is to increase the powder yield, improve the powder quality and reduce the production cost.

The rapid atomising and cooling of the solder requires a specific level of oxidation to form on the surface of the droplet. If there is too much oxygen in the atomising tower excess metal oxides form on the surface causing large conglomerations of material and poor yields. If there is too little oxygen the droplets re-combine as they cool, giving a 'rain' like effect in the tower and forming poorly shaped droplets with reduced yields. Controlling the oxygen level in the tower is complicated, as the desired and normal droplet oxidation tends to reduce the oxygen available as the atomising process proceeds.

Henkel Loctite Adhesives have been working with oxygen analysis specialists **Systech Instruments Ltd.** to take a fresh look at the requirements for efficient production of solder powder, with the aim of increasing the efficiency in both their lead and lead-free solder regimes. In order to fully understand the powder production process and the level of control required, a Systech Model 9513 oxygen control system was implemented. Originally developed to control the oxygen level in a reflow solder oven and reduce purge nitrogen consumption, the Systech 9513 with advanced control electronics has proved ideal for monitoring and controlling the oxygen level in Henkel's atomising towers. In this application the 9513 continually monitors the oxygen level in the tower, and uses that signal together with the internal program settings and fuzzy logic controller to vary the flow rate of a bleed of compressed air into the system.

Following an extended trial of the system, Henkel engineers determined the oxygen level for optimum yield and production efficiency was ~30ppm. The Systech 9513 is now controlling the oxygen in the atomising towers at 30 +/-1 ppm, ensuring the best quality production conditions are maintained.

In addition to the improvements in yields, Henkel have also been able to reduce the amount of nitrogen used to inert their towers. This has resulted in direct cost savings of over £8000 per year per tower, offering Henkel an excellent return on investment and minimal payback time.



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