

Involvement in Lead-Free Process Development

Bob Willis has been involved with the introduction and implementation of lead-free process technology for the last seven years. He was responsible for co-ordination and introduction of the first series of hands-on lead-free training workshops in Europe for ***Cookson Electronics during 1999-2001***. These events were run in France, Italy and the UK and involved lead-free theory, hands-on paste printing, reflow, wave and hand soldering exercises. Each non commercial event provided the first opportunity for engineers to get first hand experience in the use of lead-free production processes and money raised from the events was presented to local charity. More recently he co-ordinated the ***SMART Group Lead-Free Hands On Experience*** at Nepcon Electronics 2003. This gave the opportunity for over 150 engineers to process four different PCB solder finishes, with two different lead-free pastes through convection and vapour phase reflow. He also ran the ***Experience 2 & 3*** in 2004/2005. 2006 sees Nepcon back at Birmingham and Bob will again be organising the features.

He has also run training workshops with research groups like ***ITTF, SINTEF, NPL & IVF*** in Europe. Bob has organised and run three lead-free production lines at international exhibitions ***Productronica, Hanover Fair*** and ***Nepcon Electronics*** in Germany and England to provide an insight to the practical use of lead-free soldering on BGA Ball Grid Array, CSP Chip Scale Package, 0210 chip and through hole intrusive reflow connectors. This has resulted in technical papers being published in Germany, USA and the United Kingdom. Bob also defined the process and assisted with the set-up and running of the first ***Simultaneous Double Sided Lead-Free Reflow*** process using tin/silver/copper for reflow of through hole and surface mount products. This year 2005, he will be running a Lead-Free Production and Seminar feature at Productronica in Munich Germany with Global SMT magazine.

Bob also had the pleasure of contributing a small section to the first Lead-Free Soldering text book ***Environment - Friendly Electronics: Lead-Free Technology*** written by ***Jennie Hwang*** in 2001. The section provided examples of the type of lead-free defects companies may experience in production. Further illustrations of lead-free joints have been featured in here most recent publication ***Implementing Lead-Free Electronics*** 2005.

Mr Willis led the ***SMART Group Lead-Free Mission to Japan*** and with this team produced a report and organised several conference presentations on their findings. The mission was supported by the DTI and visited many companies in Japan as well as presenting a seminar in Tokyo at the British Embassy to over 60 technologists and senior managers of many of Japans leading producers.

Bob was responsible for the *Lead-Free Assembly & Soldering "CookBook" CD-ROM* concept in 1999, the world's first interactive training resource. He implemented the concept and produced the interactive CD in partnership with the *National Physical Laboratory* (NPL), drawing on the many resources available in the industry including valuable work from NPL and the DTI. This incorporated many interviews with leading engineers involved with lead-free research and process introduction; the CD-ROM is now in its 3rd edition.

Bob has recently produced three new lead-free interactive CD-ROMs with Soldertec Global/Tin Technology covering *Hand, Wave and Reflow Soldering* each CD introduced by Kay Nimmo world leading expert on lead-free and the WEEE and RoSH legislation.. These CDs complement the range of lead-free training CD-ROM offered by Bob who has just introduced a CD entitled *PCB Design, Layout, Assembly and Lead-Free Defect Guide*.

Recently Bob has produced one of the first set of *Lead-Free Inspection Wall Charts* covering reflow and wave solder joints using lead-free terminations and different alloys and PCB finishes. New sets recently introduced cover *BGA X-Ray Inspection & BGA Optical Inspection*.

Although the problems associated with fillet lifting of through hole joints have been well documented by many researchers, it was Bob Willis who highlighted the same problem could exist with pin in paste/intrusive reflow and selective soldering processes. He demonstrated that the problem could occur with each of the common lead-free alternative alloys, but despite its poor appearance provided reliable joints even after 2000 thermal cycles. He has recently produced video simulations of fillet lifting to help understand the way fillet lifting occurs, similar to the work done in the US by NIST.

Bob has conducted workshops on lead-free production process for *IPC, APEX & Nepcon Exhibitions* in the USA as well as SMT Nuremberg and Productronica, Germany and *Nepcon Malaysia*. In addition Bob has coordinated the annual *SMART Group Lead-Free Update Seminars* with the SMART Group PR Director, Mike Judd for the last six years. He has also assisted with the launch of two *DTI Lead-Free Reports* written by representatives of Soldertec global and NPL at two Nepcon Exhibitions.

Currently Mr Willis is supporting the NPL "*Lead-Free Masterclasses*" workshops on design, manufacturing and rework which are being presented around the UK. These workshops are sponsored by EM&T magazine.



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