New World Wide On Site Workshops for 2011

"Cleaning Printed Circuit Assemblies, Design & Process Control Workshop"
"Package on Package (PoP), STACK Assembly, Rework and Inspection"
"BMC (Bottom Mounted Component) LGA (Land Grid Array) QFN (Quad Flat No-lead) Design,
"Printed Circuit Board Inspection and Quality Control"
"Practical Failure Analysis in Printed Board Assembly"
"Counterfeit Component Workshop- Causes and Cures"
"Troubleshooting Your Lead Free Assembly Yields - On Site or Offshore"
"Flexible Circuit Board Design and Assembly with Lead-Free Alloys"
"Lead-Free Selective Soldering, Design, Quality Control and Practical Solutions"
"Vapour Phase & Convection Reflow For Lead Free– Selecting a Reflow Process"
"Conformal Coating Application and Inspection Workshop"
"BGA, CSP and Flip Chip PCB Design and Assembly"

Additionally we offer online webinars www.bobwillisonline.com

A selection of the practical workshops we are able to provide world wide:

Cleaning Printed Circuit Assemblies, Design & Process Control Workshop

Bob Willis – ASKbobwillis.com

Workshop Introduction:

The majority of the industry worldwide have been running no clean processes for many years and have often, understandably, neglected important issues like design for cleaning, selecting compatible components and compatibility between cleaning materials and flux residues. With increased miniaturisation and the demands of modern circuits cleaning has come back into fashion. Conformal coating is another process which has demanded special levels of surface cleanliness to guarantee coating adhesion and long term reliability. Although there are high reliability produces that use coating with no clean others want that extra confidence.

Each delegate will receive a FREE set of cleaning inspection and quality control wall charts which also cover defects seen during assembly.

Workshop topics include:

PCB Design for cleaning
Testing component compatibility
Flux compatibility with cleaning solvents
Solubility of soldering residues
Cost of process chemistry and equipment
Inline or batch cleaning options
Process cleaning capability, simple shop floor analysis methods
Water, semi aqueous or solvent?
Determining cleanliness standards
Ionic, SIR and visual inspection methods
Environmental requirements of cleaning
Cleaning no clean flux residues

Who should attend?

This session is ideally suited to design, production and quality engineers looking at future technology and maintaining a company technology roadmap. It's vital to subcontractors to be up-to-date with new technology and its possible implementation along with material and equipment requirements for future customers.

Package on Package (PoP), STACK Assembly, Rework and Inspection

Bob Willis ASKbobwillis.com

One or Half Day Workshop

Workshop Introduction:

Package on Package (PoP) applications are growing in popularity for mobile and handheld professional electronics applications and with it placing further demands on assembly engineers. In simple terms POP represents the stacking of components one on top of another either during the original component manufacture or during printed board assembly. As real estate is at a premium for logic and memory, PCB designers say the only way to go is up and up. POP packaging systems may include direct soldering, wire bonding or conductive adhesives for device to device interconnection.

PoP is new to many contract and OEM assembly staff but with the demands of paste dipping, reflow warpage, increased placement accuracy/Z height control process introduction can be demanding. The difficulty in multi level ball inspection can be a challenge for x-ray equipment procedures as level one balls can mask level two and three interconnections. Manual inspection can be used but with these applications space is often not available for side viewing.

Each delegate will receive a FREE set of Package on Package inspection and quality control wall charts covering optical and x-ray inspection, dip flux and paste application, placement criteria and defects seen during assembly.

Who should attend?

This event is ideally suited to design, production and quality engineers looking at future technology and maintaining a company technology roadmap. It's vital to subcontractors to be up-to-date with new technology and its possible implementation along with material and equipment requirements for future customers.

Workshop topics include:

What is Package on Package (PoP)?
Benefits of PoP Stack Packages
Component Standards
- Component Types
- JEDEC Standards

PCB Design Rules
- Pad Layout
- Via Hole Connection

Lead-Free Assembly
Engineering Interviews
Stencil Printing
POP Placement
- Tack Flux
- Dip Solder Paste

Reflow Soldering
- Convection
- Vapour Phase
- Temperature Profiling

Inspection
- Optical Inspection
- X-ray inspection

Underfill
Rework
Package on Package Defects

LGA (Land Grid Array) QFN (Quad Flat No-lead) Design, Assembly & Rework Guide

Bob Willis ASKbobwillis.com

Workshop Introduction:

LGA and QFN have fast become a common package type often used in many professional portable products. With any new device type there is always a learning curve for design, process and quality engineers who have to get to grips with the challenges that these packages bring. Each step of the implementation process for LGA/QFN devices will be reviewed along with results of practice process trials with these devices. Included with this workshop will be a set of optical and x-ray inspection charts for each delegate to use in manufacture. The workshop presenter is well known for his practical workshops and supported by Bob Willis unique process video experiments LGA/QFN are guaranteed to come alive.

Who should attend?

This workshop is designed for design, process and quality engineers responsible for introducing products containing LGA/QFN. Much of the material presented is extremely visual and practical making it ideal for manufacturing staff, like all the instructors workshops it not just theory, it's a **"How to Do It Session"**

Workshop Topics Included:

Component Package Types
Component Construction
MSD Handling Levels
Solderability Testing Packages
Printed Board Layout on Rigid and Flexible Circuits
Solder Mask Layout Options
Lead-Free Stencil Printing Options
Placement and Component Packaging
Convection and Vapour Phase Soldering Yields
Visual Inspection Criteria
X ray inspection Criteria
LGA/QFN Rework and Replacement
Array Solder Joint Reliability
Common Process Problems with LGA/QFN

The following workshops are also available on site with a combination of theory or hands on content which allows more flexibility for on site training. Soldering workshops can be based on tin/lead or lead-free technology. If you need something special we can create a workshop for you.

0201 0155 Component Design, Assembly and Inspection

Basic Printed Circuit Board Manufacture and Process Defects

Producing and Presenting Technical Presentations

Double Sided Reflow Design and Assembly

Selecting Solderable Finishes for BGA and Fine Pitch Assembly

Ball Grid Array Technology Design, Assembly and Inspection

Practical X-Ray Inspection of BGA and Quality Standards

Printed Board Design for Manufacture and Assembly in Lead Free

Pin in Hole/Intrusive Reflow Design and Assembly

Wire Preparation and Crimping Workshop

Lead-Free Assembly and Soldering

Hand Soldering and De-Soldering

Hands On Solder Paste and Stencil Printing

Quality Control of Surface Mount Assemblies

Hands On Wave Soldering

Static Control in Electronic Assembly

Design and Assembly of SMT Boards

Rework and Repair of Surface Mount and BGA

A-Z of Modern Electronic Assembly of PCBs

Reflow Soldering and Temperature Profiling

Counterfeit Component - Causes and Cures Workshop

Bob Willis ASKbobwillis.com

Workshop Introduction:

Quality, purchasing, design and production engineers need to review the growing commercial and technical issues surrounding counterfeit electronic components. They can look right, solder to the PCB but just fail to function. A typical first assumption by test engineering, it's a component failed due to the assembly process, but its what's inside the package that counts, sometimes its nothing at all.

Rather than making complicated copies of parts the simplest thing is to remark the packaging or the component body. Remarking the packaging is simple and quick, provided the component identification is not checked all the parts would be placed and soldered to the board before the problem was identified. AOI should find incorrectly marked or variations on the parts but the level of sophistication in marking is now becoming very sophisticated.

The workshop will not only illustrate the problems raised by counterfeit components within the electronics industry but it will also show you some of the different test methods that can be used to confirm the integrity of the components. Failure analysis techniques are now frequently being used to see if components are what they say they are rather than finding failure modes. Regular workshops with ITRI innovation in the UK show that counterfeiting is on the increase, we can find them, there is no hiding place! The workshop also includes a ***FREE*** set 28 wall charts covering testing and counterfeit avoidance procedures for each delegate to use on site.

Who should attend?

This workshop is designed for design, process and quality engineers responsible for introducing procedures and testing to avoid the counterfeit components being integrated to products.. Much of the material presented is extremely visual and practical making it ideal for manufacturing staff, like all the instructors workshops it not just theory, it's a **"How to Do It Session"**

Workshop Topics Included:

- Component trends in industry
- Counterfeit Avoidance strategy
- Component Identification Checksheet
- Component obsolescence
- Impact of lead-free on component availability
- Typical examples of component counterfeits
- Guidelines on reducing the possibility of counterfeits
- The different types of counterfeit
- Mechanical testing component packaging
    - Destructive and non-destructive
- Electrical testing of components
- Visual & microscopic inspection
- Solvent testing
- XRF techniques
- X-ray inspection of passive and active parts
- Practical examples of counterfeit components found
- Using Free On Line Defect Database

Vapour Phase & Convection Reflow – Selecting a Reflow Process

Bob Willis ASKbobwillis.com

Workshop Introduction:

Having grown up with IR and Vapour Phase Soldering VPS during the introduction of surface mount technology its fail to say that some processes never die they just get better. Convection reflow took over from IR technology and changed the way industry looked at vapour phase but now its back. For some companies VPS never went away a simple one profile process, in Japan high end application used VPS during the introduction of lead-free technology

Both convection and vapour phase can produce reliable lead-free assemblies, there are advantages and disadvantage to any technology but they both work well and can be very cost effective that is what our surveys have said. We also bring four years of experience with lead-free using both techniques to the conference.

In this workshop the instructor will look at all aspects of the different processes, soldering performance and yield from different joint terminations, solder finishes and joint structures. Each delegate will also receive a ***FREE*** set of Bob Willis Inspection Wall Charts covering reflow soldering of lead-free terminations and common defects found in manufacture.

Who should attend?

This workshop is designed for process and quality engineers responsible for selection and running reflow systems, inspection or auditing staff visiting contract assembly facilities. The workshop presented is extremely visual and practical, like all the instructors workshops it not just theory, it's a **"How to Do It Session"**

Workshop Topics Included:

Vapour phase and convection reflow overview
Process parameters
Nitrogen/inert environment myths
Advantages & disadvantages of the process options
Design and layout considerations for VP
PCB solder finishes for VP & convection
Vapour phase materials and cost
Batch or inline operation
User experiences with VP materials and equipment
Profiling boards assemblies in both processes
Solder paste requirements
Comparing single and double sided reflow yields
Soldering flexible assemblies
Inspection results for reflow soldering
Microsection examination

Lead-Free Selective Soldering, Design, Process Challenges and Practical Solutions

Bob Willis ASKbobwillis.com

Workshop Introduction:

For many organisations through hole components will remain a reality for many years. More and more surface mount components are used in design, through hole is in decline, however the reality is connectors, transformers, switches, LCD displays and electrolytic capacitors are sill necessary in many products. So what is the most reliable and cost effective solution to through hole soldering in a lead-free environment? Selective soldering has become more popular in the last few years for small and large companies alike. Selective wave and point soldering are both options but what are the realities.

In this workshop the instructor will look at all aspects of the different processes, soldering performance and yield from different joint terminations, solder finishes and joint structures. Each delegate will also receive a ***FREE*** set of Bob Willis Inspection Wall Charts covering soldering of lead-free terminations and common defects found in manufacture.

Who should attend?

Process engineers tasked with process introduction, quality staff, and supervisors wanting to understand the process issues with lead-free selective soldering. Design engineers will benefit from a better understanding of the process they are designing circuit boards to pass through. The workshop may also benefit material, equipment suppliers to have a better understand of all the issues and interactions with new alloys and modern printed circuit design.

This session will cover:

- Why use selective soldering
- User experience of selective wave point soldering with lead-free
- PCB design rules for selective soldering
- Flux requirements for selective soldering
- Compatibility of solder masks and lead-free solder
- Setting up lead-free profiles, you must profile a selective process!!!
- Solder alloy choices
- Inspection criteria for selective
- Copper dissolution with selective
- Soldering defects on selective – Causes and Cures
  - Dendrite growth - Solder balling
  - Poor penetration - Copper saturation - Copper needles

Conformal Coating Applications, Inspection, Rework & Quality Control Workshop

Bob Willis ASKbobwillis.com

Workshop Introduction:

The use of Conformal coating has provided benefits to industry for many years either in the high reliability market sector or where products have to deal with extreme environmental conditions or simply in use in consumer applications. The use of coatings is seen in different industries like telecommunications, automotive and consumer products have benefited from the use of selective coating but for different reasons.

This workshop will provide a simple guide to the use of coatings, their application and process, product benefits, inspection and quality control. A practical session will also allow delegates to examine coated boards using different materials and inspect the coating application.

Each delegate will also receive a ***FREE*** set of colour Inspection Wall Charts covering coating application and common defects to use on their manufacturing shop floor. During each workshop there are opportunities to win some of Bobs interactive CD ROMs for best questions of the session.

Who should attend?

This workshop is designed for design, process and quality engineers responsible for introducing coating materials, inspection or auditing presented is extremely visual and practical making it ideal for manufacturing staff, like all the instructors workshops it not just theory, it's a **"How to Do It Session"**

Workshop Topics Included:

Why Conformal Coat
Clean or No Clean
Coating Material Options
Coating Process Options
Cost of coating assemblies
SIR and cleanliness testing
Cleanliness testing methods
Reliability of Coating
Testing & Evaluation of Coatings
Correct design for coating
Masking options and methods
Inspection & Quality Control of Coating
In-house or Contracting Services
Inspection of coatings & methods
Rework & repair of board assemblies

Troubleshooting Your PCB Assembly Yields - On Site or Offshore

Bob Willis ASKbobwillis.com

Workshop Introduction:

Lead-free assembly can contribute to higher defect levels in manufacture; however, this is not necessarily seen at each assembly process. Common process problems today relate to the selection of PCB materials, surface finishes and soldering materials, some are cosmetic others potentially reliability concerns. During this workshop delegates will see problems mostly common in industry, what are the solutions or ways of investigating the root causes. Delegates will be shown how to use free online soldering defect databases to solve process problems 24/7. Delegates can also bring process problems, board assemblies for discussion and hopefully a resolution to their current manufacturing nightmare.

Each delegate will receive a ***FREE*** set of colour wall charts to aid lead-free inspection and the fault identification in manufacture. Delegates will also have the opportunity to win interactive training CD-ROMs on inspection, design and rework for best questions in the session.

Who should attend:

This session aims to provide a practical introduction to issues of lead-free process yield improvements and troubleshooting and is suitable for engineers, supervisions and operators looking at the issues faced with lead-free assembly on site or off shore. It will also give an incite to equipment suppliers and component manufactures on what may need to be addressed on products in the future.

This session will cover:

- Modern SMT assembly & common opportunities for failure
- Top Ten process failures in Lead-Free Assembly
  - Components, PCBs and Assembly
- Practical first level failure analysis in manufacture
- Defining process parameters
- Key process checks during assembly
  - Reflow, Wave, Selective and conformal coating
- Monitoring contract assembly process yields
- Solving defects 24 hours a day

Flexible Circuit Board Assembly, Rework with Lead-Free Alloys

Bob Willis   ASKbobwillis.com

Workshop Introduction:

The flexible circuit is another packaging technology which has seen wider acceptance in the electronics industry. The advantages of surface mount reduced weight; decreased size can be further enhanced by flexible circuitry. In many cases, it is a misconception that flexible circuits have to flex, they don't many flexible are designed purely to aid the circuits design and assembly into a final product. In this case the substrate is only flexed or formed once. The range of constructions for circuit manufacture are wide but the basics are similar to existing printed circuit production. The design and selection of the manufacturing methods can affect on the final cost of the circuit and need to be considered in detail prior to manufacture. Were design department have limited experience useful reference material is available to engineers world wide with the release of Flexible Circuit Technology, Third Edition by Joe Fjelstad.

This workshop will focus on the assembly processes used for the flexible circuits. Each delegate will receive a ***FREE*** set of colour wall charts to aid lead-free inspection and the fault identification in manufacture. Delegates will also have the opportunity to win interactive training CD-ROMs on lead-free inspection, design and rework for best questions in the session.

Bob is happy to take delegate questions in advance of the workshop, these will be answered in the during the conference session. bob@leadfreesoldering.com

Workshop Topics Included:

Flexible Design for assembly
Manual assembly and soldering
Automatic assembly process requirements
The need for baking flexible circuits
Flexible circuit pallets for automatic assembly
Screen printing, placement, reflow soldering & AOI
Manual hand soldering and de-soldering
Rework of conventional and surface mount
Solder joint Inspection
Process defects on flexible circuits and during assembly

Practical Lead-Free Experience 4 Years - The Full Story, So Far

Bob Willis – SMART Group/LEADOUT Lead-Free Experience Co-ordinator

Duration : One or Half Day Workshop

Workshop Outline:

For the last four years, SMART Group have organised and run a complete production feature on lead-free assembly. For the last two years LEADOUT has supported this unique event in the United Kingdom. LEADOUT is Europe's largest European electronics industry activity helping small and medium volume companies make the change to lead-free soldering and to improve their process yields in the assembly of PCBs and through this enable them to compete effectively in the open market. Bob Willis has organised and run the "Hands On Lead-Free Experience" and produced a 100 page report on all the practical experience gained from these events. The Lead-Free Experience has enabled many engineers to get hands-on experience from many of the industry experts and seek independent advice on the practical issues relating to lead-free manufacturing.

Four different PCB finishes, three laminates, solder alloys, reflow technologies, rework options, inspection techniques and mechanical testing has been made available at each event. After the events microsection analysis and further testing has been conducted to back all the process parameters gathered. This workshop presentation will offer delegates some amusing but helpful and practical feedback, stories and process parameters from behind the scenes of this lead-free feature. Delegates will receive a copy of the presentation, a set of lead-free inspection standards and a copy of the Lead-Free Experience Report to download. Question & Answer Session on Lead-Free design and production process issues can be included after the workshop; delegates can pose questions prior to the workshop to guarantee a detailed answer; which can be emailed in advance.

Who should attend?
Process engineers tasked with process introduction, quality staff, and supervisors wanting to understand the process issues with lead-free. Design and procurement staff will benefit from the impact of component selection and design on process yield. The workshop would also benefit material and equipment suppliers to gain a better understand of all the issues and interactions with new alloys.

Topics Included:
Assembly of rigid and flexible circuit boards
Solder finishes evaluated
– Gold, Copper OSP, Tin, Silver & Solder
Levelled
Component and plating finishes testing
Stencil printing and aperture design
Through hole reflow results
Reflow with vapour phase and convection
Using wetting tests to compare yields
Wave soldering surface mount and through hole
Temperature profiling results
Cleaning lead-free residues and cleanliness
AOI and X-ray inspection results
Solder joint shear testing
Inspection PPM Process Monitoring results
Lead-Free defects and causes

Introduction to Ball Grid Array Design & Assembly

Bob Willis ASKbobwillis.com

Workshop Introduction:

Ball Grid Array packages have been used in the industry for some years but only now are they widely available for commercial use. Just like surface mount, the use of BGA's can affect printed board layout, assembly, inspection and repair process. BGA's do however provide significant advantages over fine pitch components particularly in terms of process assembly yield. Correct design, printing and profiling is necessary to obtain the highest yields and reliably interconnection.

Everyone blames the BGA often because you cant see under the package but is it the real failure mode. Bob produced the first video tape and interactive CD-ROM on BGA technology, practical advice is what you get on any of Bobs' sessions supported by unique video clips to make the session come alive.

Who Should Attend

All staff involved in the process of area array soldering with tin/lead and lead-free BGA assembly processes; including procurement, design engineers, reliability, quality personnel, failure analysts, and management involving is setting standards, inspection and product assessment of boards containing BGA, CSP, LGA and other area array components. As this workshop deals with many of the common issues in manufacture its also valuable to shop floor staff.

Topics include:

BGA advantages and disadvantages
BGA suppliers
Design rules
Printed board layout
Pad and resist footprints
Surface finish selection
Inspection/assembly marks
Assembly process

Solder paste printing
Flux reflow methods
Temperature profiling
Reflow by convection and vapour phase
Rework procedures
BGA failures, Package cracking
Solder balls, Misalignment, Non reflow
Inspection criteria

Step by Step Ball Grid Array & Surface Mount Rework and Repair

Bob Willis ASKbobwillis.com

Workshop Introduction:

Surface mount and BGA rework and repair can be straight forward if simple rules are followed. This workshop will give each delegate a step by step blue print to introduce rework successfully into manufacture. Guidelines will be given on selecting rework equipment, materials and training procedures for defect free soldering. Using Bob Willis unique video clips during the workshop each delegate will be shown how to conduct successful rework and what are the potential problems.

Bob Willis was the creator of the Worlds first video tapes and interactive CD-ROM on BGA Technology, X-Ray Inspection and BGA Rework. Your company will receive one copy of his interactive CD-ROM covering surface mount and BGA rework and repair procedures valued at £100 plus wall charts for rework and inspection standards.

Who should attend?

Process engineers, quality staff, and supervisors tasked with setting up a rework area. Staff wanting to understand the process issues with lead-free. The workshop would also benefit material and equipment suppliers to gain a better understand of all the issues and interactions with tin/lead and new lead free alloys in rework and repair.

Topics include:

Introduction to rework, where + why rework
Soldering standards & defects, IEC, IPC, BT standards
Temperature profiling rework sites
Rework methods for:
SOIC, QFP, TSOP, BGA & CSP

Hot gas systems
Soldering irons
Conductive tweezers
Reflow blocks
Rework of single/double sided boards
Replacement methods for:

SOIC, QFP, TSOP, BGA & CSP

Reballing BGA
Practical demonstrations
Rework related defects

Step by Step Practical Failure Analysis in Printed Board Assembly

Bob Willis ASKbobwillis.com

Simple Guide to Failure Analysis Techniques - How & Why Failures Occur in Electronics
"Different levels of failure analysis exist, from the very basic with virtually no equipment, to the use of a full failure analysis laboratory. Often simple analysis methods can point engineers in the right direction, but proving the root cause of failure often needs the electronic pathologist with all his investigation tools. When conducting any failure analysis it is important the results prove the cause of the fault. The true reason for failure needs to be clear and proven with hard facts, not just opinions."

Workshop Outline:

This workshop is unique as it outlines the techniques you should consider along with practical case studies from the instructor's many years in manufacture. Many practical case studies using different techniques to examine failures on different interconnections will be examined with extensive examples and recommended corrective action. Delegates will also be able to see what different analysis techniques exist and find what a laboratory service will require when you need to arrange your own study. The workshop is conducted by ***Bob Willis*** who offers failure analysis services to the industry on-line and has long been regarded as one of the leading specialist in printed board assembly problem solving.

Printed circuit boards
Solder joints
Conventional components
SMT components
Area array, BGA, Flip Chip devices
Wire wrap joint
Crimp terminals
Connectors

Workshop topics include:

Destructive and non destructive analysis techniques will be reviewed including:

Microsectioning
Optical microscopy
Real time X-ray analysis
Scanning Electron Microscopy SEM
Acoustic microscopy
XRF Measurement
Borescope
Chemical Analysis
Crack detection
Contamination assessment
Bond & shear measurement
Solderability measurement

Package opening techniques will be explained with their advantages and disadvantages:

De-lidding
Grinding
Jet etching
Chemical swelling
Cutting & sawing

Who should attend this workshop?

The workshop is designed for engineers, supervisor and quality engineering staff who need to solve manufacturing and product failures. It is also ideal for procurement staff who may be a faced with supplier related failures. Many component, material and printed board suppliers have attended this course in the UK and have benefited in understanding the process problems that can occur.

Pin In Hole/Intrusive Reflow Implementation with Lead-Free

Master Class Instructor Bob Willis ASKbobwillis.com

Duration : One or Half Day Workshop

Course Objectives :

Surface Mount Technology (SMT) is part of mainstream electronic assembly with virtually all market sectors benefiting from the use of SMT. One problem that has always proved an issue to design and process engineers is the use of existing through hole components where no direct equivalent SMT parts are available. Hence the interest in Pin in paste, intrusive reflow, multi spot soldering, regardless of the name it's a perfect option to eliminate the wave soldering process.

Bob produced the Worlds first training video, interactive CD-ROM, inspection standards and manual on intrusive reflow. His unique micro video clips provide an ideal way of understanding the technology and how to succeed. Selective soldering can provide excellent results but requires capital equipment investment. One method of soldering all surface mount and through hole components in a single operation is Pin-In-Hole-Reflow which simplifies the manufacturing process. Each delegate attending will receive a set of intrusive reflow inspection posters to aid their process introduction.

The workshop will cover the following key points:

PCB Design and Component Requirements
PIHR Advantages and Disadvantages
Paste Application by Stencil Printing, Double Stencil Print, Dispensing
Stencil Aperture Calculations
Stencil Design Rules
Solder Pallet Support
Placement Options Manual and Automatic
Reflow Soldering Profiles for Convection & Vapour Phase
Inspection Requirements
X-ray voiding assessment
Microsection Analysis
Practical Implication issues
Process Defects
Reliability of through hole joints

Question & Answer Session on Lead-Free design and production process issues can be included after the workshop, delegates can pose questions prior to the workshop to guarantee a detailed answer; these can be emailed to bob@leadfreesoldering.com

Ball Grid Array Inspection Lead-Free Defect Guide

Master Class Instructor Bob Willis   ASKbobwillis.com

Duration :   One or Half Day Workshop

Area Array Technology is part of mainstream electronics but until recently very little inspection criteria were available in the industry. The assembly process for BGAs is fairly well understood for tin/lead alloys but with the move to lead-free assembly, new QFN and LGA packages there are critical issues to consider during inspection. The workshop covers optical and x-ray inspection of solder joints for both tin/lead and lead-free terminations. It includes an introduction to the lead-free assembly process with specific attention to BGA and area array devices. It provided a step by step guide to the procedure of inspection for optical and x-ray showing you how to do it. Inspection criteria are included for x-ray and visual criteria on different lead-free terminations and pad surfaces. Delegates will each receive a set of BGA optical and x-ray inspection posters, chance to win a copy of a interactive CD-ROM covering BGA Inspection and Lead-Free Defects and a copy of "X-Ray Inspection Criteria & Common Defect Analysis" a book Bob co-authored with Dr David Bernard of DAGE.

Who Should Attend

All staff involved in the process of area array soldering with tin/lead and lead-free BGA assembly processes; including procurement, design engineers, reliability, quality personnel, failure analysts, and management involving is setting standards, inspection and product assessment of boards containing BGA, CSP, LGA and other area array components. As this workshop deals with many of the common issues in manufacture its also valuable to shop floor staff.

Topics Covered

Modern Lead-Free Assembly Processes
Lead-free Alloys - BGA – Area Array – Land Grid Array Reflow
Inspection Techniques
Inspection Procedures - Optical Inspection - X-Ray Inspection
Plastic BGA, Ceramic BGA, Column Grid Array, Land Grid Arrays
Moisture cracking
Effect of incorrect profiling
Dye crack testing (Dye and Pry)
Common process problems
Lead-free and tin/lead paste
Defect Guide
Inspection Criteria

Question & Answer Session on BGA and production process issues will be included after the workshop. Participants can pose questions prior to the workshop to guarantee a detailed answer.

Lead-Free Design for Manufacture Assembly Workshop

Master Class Instructor Bob Willis ASKbobwillis.com

Duration : One or Half Day Workshop

This workshop is aimed at Design, Production and Quality Engineers. It will provide a better understanding of the effect lead-free will have on printed board design, specification and procurement. Component specification and testing requirements to meet WEEE and RoHS will be discussed along with the simple guidance on ranking circuit board solder finishes. Layout changes that benefit a lead-free process will be highlighted as well as the subtle changes to improve yields on existing designs. Design modification that have been used to reduce or eliminate fillet lifting, pad lifting will be illustrated and their apparent success or failure.

Lead-Free Design for manufacture workshop will include:
Component specification, selection and WEEE & RoHS compatible
Laminate changes, options and industry trends
Through hole pad sizes & fillet lifting
PCB Supports – Eliminating Warp and sag
Via hole plating and reliability with lead-free processes
Copper thickness and Lead-Free copper erosion
Solder finish selection, storage life and process compatibility
Eliminating wave soldering with intrusive reflow
CAF and reliability in lead-free
Solder mask specification
Optimising hole fill with lead-free intrusive reflow
Multilayer thermal break design
Through hole solder thieve designs
Modifying breakouts for lead-free
Optimising SMT placement for lead-free
Modification of paste stencil apertures

Question & Answer Session on pin in hole reflow and production process issues can be included after the workshop, delegates can pose questions prior to the workshop to guarantee a detailed answer; these can be emailed to bob@leadfreesoldering.com

A - Z of Lead Free Soldering Master Class

Master Class Instructor Bob Willis ASKbobwillis.com

Duration : One or Half Day Workshop

This Master Class is a practical introduction to the changes necessary in design, component selection, assembly and soldering with lead-free alloys. It covers the practical experience gained during lead-free trails, process introduction and running hands on lead-free lines and training events for the past 5 years. Bob presents a practical introduction to lead-free and illustrates many of the process stages and defects with his unique micro video photography which helps to bring the Master Class alive. Each delegate attending the Lead-Free Master Class will receive an interactive Lead-Free Training CD-ROM and a set of inspection posters to aid their process introduction.

Who should attend?

Process engineers tasked with process introduction, quality staff, and supervisors wanting to understand the process issues with lead-free. The Master Class may also benefit material, equipment suppliers to have a better understand of all the issues and interactions with new alloys.

Topics Covered

Component Specifications
Shop floor solderability testing
Printed circuit board requirements
Production solderability testing coupons
Comparison of board surface finishes
Solder paste printing
Changes to solder paste stencils
Controlling paste alloys
Inspection criteria
Component placement and alignment
Reflow soldering requirements for lead-free
Convection and vapour phase soldering
Profiles for lead-free
Wave soldering machine changes
Soldering parameters
Board Support
Solder alloy control
Dross generation
Lead-free specific soldering defects
Secondary reflow
Copper erosion of pads
Fillet lifting of joints
Solder contamination
Copper removal
Visual Inspection criteria
X-ray criteria for lead-free
Rework and repair procedures
Hand Soldering and De-soldering
Process monitoring
PPM Yield results

Lead-Free Inspection, Process Control and Defect Elimination

Master Class Instructor Bob Willis   ASKbobwillis.com

Duration :   One or Half Day Workshop

Lead-free assembly does have an impact on the design, manufacture and the potential reliability of printed board assemblies. Although the fundamental processes do not change, process parameters do change and there are process issues what are coming to light that do affect yields. This workshop will provide a practical insight into the inspection criteria, changes to process conditions and how to monitor the process to obtain the highest yields. The session will also illustrate the potential problems at each stage of manufacture and how to avoid them and where necessary changes to IPC criteria will be required. Monitoring solderability of boards and components in production with simple tests will be illustrated. Many of the instructors short lead-free video clips are used during the workshop to show how different alloys reflow, joints form and defects occur, making this session totally unique.

Each delegate will receive a set of lead-free inspection criteria wall charts with this workshop. Also included is a lead-free interactive CD-ROM covering lead-free soldering featuring some of the instructor's unique video material to assist your company introduction.

Who should attend:

Inspection and quality control staff need to put in place controls to monitor the process and understand what will be different in a lead-free environment. Lead-free solder joints can look different, there are new cosmetic defects which need to be understood also new equipment parameters monitored in production. This makes this workshop suitable for inspection staff, process engineers and quality managers.

- Modern PCB Assembly Overview
    - Opportunities for defect with lead-free process changes
- Confirming component lead-free compatibility
- Testing for lead-free joints
- Monitoring lead-free materials control
- Marking lead-free components, boards and products
- Re-profiling, reflow, wave soldering & rework equipment
- Inspection criteria for reflow and wave soldering
- Changing IPC 610 inspection standards
- Defect types and corrective actions
    - Poor wetting
    - Fillet lifting
    - Secondary reflow
    - Lead contamination of joints
- Typical Joint failure modes
- Process yield monitoring guide

Reflow Soldering Lead-Free Alloys - Successfully

Master Class Instructor: Bob Willis ASKbobwillis.com

Duration: One or Half Day Workshop

Reflow soldering with lead-free alloys is far less demanding to convert than wave. However there are new issues of material compatibility, higher temperatures, lead contamination and the benefits of using pin in hole/intrusive reflow to consider. During this workshop each of the key stages of the reflow process will be considered and delegates will see the results of many trials showing what works and does not in the real world of manufacture. With over six years experience with lead-free materials, processes and circuit board assembly most of the issues have now been overcome.

The workshop features many typical lead-free defects and possible causes. With Bob Willis's unique micro video clips delegates will easily understanding the issues they may face. Each delegate will also receive a FREE set of colour Lead-Free Inspection Wall Charts to use on their manufacturing shop floor.

Who should attend?

Process engineers tasked with process introduction, quality staff, and supervisors wanting to understand the process issues with lead-free reflow. Design engineers will benefit from a better understanding of the process they are designing circuit boards to pass through. The workshop may also benefit material, equipment suppliers to have a better understand of all the issues and interactions with new alloys and modern printed circuit design.

Topics:

Lead free legislation and timescales
What other people say about lead-free
Component requirements
Reliability of tin/lead plating with lead-free alloys
Concerns with MSD devices
Printed board finish requirements
Selecting laminate & solder finish
Solder paste options
Convection soldering
Vapour phase for lead-free
Temperature profiling
Confirming oven capability for lead-free
Benefits of inert gas soldering
Lead-free reflow defects and causes

Printed Circuit Board Solderable Finishes for Fine Pitch and Lead-Free Assembly

Master Class Instructor Bob Willis   ASKbobwillis.com

Duration: One or Half Day Workshop

Course Objectives:

The choice of solderable finishes applied to surface mount boards can have a significant effect on the assembly yield, bow and twist, misplacement, open joints and cost of the final circuit. Tin/lead solder levelled board are still in the majority but gold, tin, silver and OSP have been growing in popularity. The workshop will demonstrate all the options available and how to evaluate the best surface finish for assembly. Bob Willis will show some of the test methods used in production to test surface finishes along with some of his own no cost techniques. During the workshop delegates will see different process failure modes and be able to judge what is cosmetic and if reliability may be affected.

Topics:

Review of solderable finishes
Current supplier base for finishes
Assembly and design advantages/ disadvantages
Ball grid array and fine pitch requirements
Process conditions for assembly process
Specification of solderable finishes
Cost of different finishes
Assembly yield improvements
Reliability of solder joints on alternative finishes
Process rejects and joint failure in production
Practical solderability testing of finishes

Who Should attend:

Ideal workshop for process and design engineers evaluating or fault finding different PCB finishes to improve existing yields or to implement for lead-free production. Beneficial to purchasing staff to better understand the products and materials and their availability in the industry.

Lead-Free Rework and Repair including Hand Soldering and De-soldering

Master Class Instructor Bob Willis ASKbobwillis.com

Duration : One or Half Day Workshop

Rework and repair of lead-free solder joints requires higher process temperatures, this can impact on the printed circuit board and components used today. The rework fluxes used and the equipment also require consideration along with greater attention to profiling board assemblies for rework. The session will provide a step by step guide to rework of all types of terminations and look at the potential problems faced with lead-free products. Attention will be payed to the types of defects that can be introduced when rework is not conducted correctly and what corrective actions need to be put in place.

Each delegate will receive a set of lead-free inspection criteria wall charts with this workshop. Also included is a New lead-free rework interactive CD-ROM covering lead-free soldering featuring some of the instructor's unique video material to assist your company introduction.

Who should attend:

This session aims to provide a practical introduction to issues of lead-free rework and repair and is suitable for engineers, supervisions and operators looking at the issues faced with lead-free rework and inspection. It will also give an incite to equipment suppliers and component manufactures on what may need to be addressed on products in the future.

Topics:

Overview of the lead-free assembly process
Soldering theory and what is different
Cored solder wire
    cored wire selection
Soldering operation
Soldering iron care
Tip corrosion issues with lead-free
Removal & replacement of through hole
Removal & replacement of surface mount
BGA removal & replacement
De-soldering techniques
Reliability of mixed alloy joints
Lead-free inspection criteria
X-ray inspection of joints
Typical lead-free defects

Lead-Free Wave Soldering Process Troubleshooting

Master Class Instructor Bob Willis ASKbobwillis.com

Duration : One or Half Day Workshop

Do we have all the answers to successful lead-free wave soldering? No, and to quote a well known soldering metallurgist, "We don't even know all the questions". Lead-free is new to many and the wave soldering process is the most affected by the change of materials with cost increase in alloy, solder bath and copper erosion plus increased temperatures all makes process change demanding. During this workshop we will look at the practical experience to date and try to provide answers to as many questions that have come to light during early introduction.

Each delegate attending this workshop will receive an interactive CD-ROM valued at $175 covering all aspects of wave soldering and an interactive defect guide with the most common lead-free defects. Also delegates will receive a set of inspection posters for lead-free solder joints.

Who should attend?

This session aims to provide a practical guide to lead-free wave soldering for engineers, supervisions and operators looking at setting up, operating or selecting materials and equipment. It will also give an incite to equipment suppliers and material manufactures on what may need to be addressed for today's circuit designs.

Topics:
Cost of lead-free
Soldering theory, wetting, reliability, PCB design
Copper erosion problems
Effect of tin-lead on joint reliability
Soldering materials
Spray fluxing
Equipment settings, pre heat, fluxer, wave settings
PCB board support
Lead-free soldering parameters
Inert soldering
Solder bath erosion
Effect of bath contaminates
Quality control checks
Soldering defects, causes and cures
- Fillet lifting
- Secondary reflow
- LF solder shorts
- damaged components

Ball Grid Array, CSP & LGA Inspection Lead-Free Defect Guide

Master Class Instructor Bob Willis ASKbobwillis.com

Duration : One or Half Day Workshop

Area Array Technology is part of mainstream electronics but very little inspection criteria is available in the industry. The assembly process for BGAs is fairly well understood for tin/lead alloys but with the move to lead-free assembly there are critical issues to consider during inspection.

The workshop covers optical and x-ray inspection of solder joints for both tin/lead and lead-free terminations. It includes an introduction to the lead-free assembly process with specific attention to BGA and area array devices. It provided a step by step guide to the procedure of inspection for optical and x-ray showing you how to do it. Inspection criteria are included for x-ray and visual criteria on different lead-free terminations and pad surfaces. The CD provided with the workshop also includes many defect examples and causes as well as illustrating the reflow of different terminations with Bob Willis's unique micro video clips.

Modern Lead-Free Assembly Processes
Tin/Lead & Lead-free Alloys - BGA – Area Array Reflow
Inspection Techniques
Inspection Procedures - Optical Inspection - X-Ray Inspection
Plastic BGA, CSP, LGA Ceramic BGA, Column Grid Array
Moisture cracking
Effect of incorrect profiling
Dye crack testing
Common process problems
Defect Guide
Inspection Criteria

For further information and to arrange a workshop or on-line webcast contact Bob Willis

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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 recently received A ***SOLDERTEC/Tin Technology Global Lead-Free Award*** for his contribution to the industry to help the implementation of the technology. 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. Bob was recently presented with awards from the **SMTA** and **IPC** for his industry support.

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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