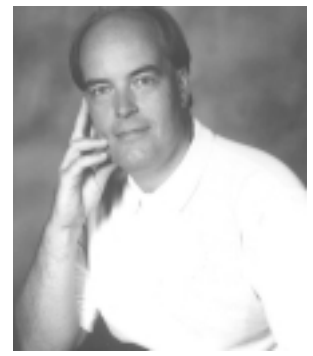


PPM or DPMO Assembly Yields Free from SMART Group



What's your PPM Parts per Million or DPMO Defects per Million Opportunities Yield?, it doesn't matter what you call your defect yields, provided you collect the process data consistently and work to improve your manufacturing yield based on the results. There are considerable advantages with process monitoring over using final test results or percentage pass rates, as these are misleading to the real process performance. The aim of the SMART Group PPM Monitoring Project is to help companies understand their process yield and compare it to the average industry performance to aid realistic benchmarking. The project has been up and running for six months so what has been achieved and what direction will it take?

The average assembly yield for screen print, placement, reflow and wave soldering is shown in the following graph for the last few months. The results are based on anonymous contributions from 18 companies in the United Kingdom. The results have been obtained from companies who have contributed to the SMART Group project web site www.ppm-monitoring.com These contributing companies have benefited from these results, they have also been able to anonymously see each contributors' results, process parameters used and the complexity of the products being produced.

PPM Yield Graphs

"The realisation of this process data collection has taken a number of years to come to fruition" reported Bob Willis, Technical Director of the SMART Group and the Group's PPM Monitoring Project Coordinator, and will provide a valuable reference to the industry which is the aim behind the DTI support. This information has simply not been available to small or medium volume companies. The project will continue to develop over the coming months to include the type of defect most commonly seen at each stage of manufacture and the component types most affected. This will allow engineers to improve process yields and assess new designs for potential yield problems.

The project is not just for assembly companies, every company contracting out products should encourage their supplier to be involved with the data collection; what have they got to lose from consistent process monitoring? Four contract assembly companies are already involved in the SMART Group PPM Monitoring Project and see there is value in providing feedback to their customers rather than working in a vacuum. To be involved in the project is simple and can be done in less than 2 hours once a month provided the procedures are in place to collect information and every company should have these systems.

Suppliers should also get involved, they should encourage customers to be involved and provide results from automatic optical inspection and X-ray equipment which would of course need to be handled slightly differently. As companies move into equipment based inspection techniques they need to know the capability of the equipment and that the information provided is related to common standards in industry. You can't just substitute an operator working to IPC criteria and put in a machine that passes and fails products without a reference?

Basically each company contributing to the PPM project inspects sample boards or panels at four manufacturing stages, screen print, placement, reflow and wave solder. The sample boards are inspected against IPC610 level 3. In the case of screen printing no inspection criteria is provided by IPC so for the project, and for possible consideration by IPC, SMART Group have produced some guidelines for paste inspection.

Bob Willis Process Guides

A document has been produced for Pin In Hole Reflow as no standards are currently available in the industry. Both documents can be downloaded freely from the website

The basic manufacturing data can also be very valuable to understand and compare the process used by each company and the results being obtained. Each process is detailed in the following ways with the yields information, see side bar listings for screen print, placement, reflow and wave solder.

Screen Printing

Printer Type
Printer Climate Control
Stencil Type
Stencil Thickness
Frame Type
Solder Paste Measurement
Board Support Type
Squeegee Blade
PCB Finish
Paste Alloy
Paste Type
PCB Thickness

Component Placement

PCB Finish
Component Vision Recognition
Component Mechanical Centring
Board Support Type
PCB Thickness

Reflow Soldering

Number of Zones
Oven Length
Air or Nitrogen
PCB Finish
PCB Thickness
Number of Layers
Paste Alloy
Flux Type
Cooling

Wave Soldering

Number of Waves
Air or Nitrogen
PCB Finish
PCB Thickness
Conveyor Transport
Flux Type
Number of Layers

www.bobwillis.co.uk

General Production Environment

Full Air Conditioning and RH Control
Air Conditioning
Basic Central Heating

Number of Boards Produced per Week
Typical Batch Size
How Many Product Changeover's per day
Company Size

Having this detailed process information on the sample being inspected for each stage makes interpretation of results meaningful. With the process information and the technology level of the board type being processed engineers have a much better way of interpreting the actual results provided on a monthly basis. The actual defect level becomes less important, it is a complete set of information which helps to make the information more useful to engineers. The final information is on the company itself and is based on recommendation from the contributors. The boards produced, batch size and how many different design changeover's is considered to be more meaningful than the actual size or turnover of the company.

In the past many industry gurus quoted yields for best in class, senior managers quoted defect levels in other companies process lines to drive process improvement. Often the data was not traceable, it could not be compared line to line, site to site but now with an open procedure in place anyone can do it, you just need to be honest with your results and the methods used. The beauty of the project is its free to the industry all that is needed is a little time and effort.

The next stage in the SMART Group PPM Monitoring Project is to collect defect results against a defect list for each stage in the manufacturing process in the same way as many companies already plot attribute data. The results will be listed against the type of component which should aid engineers' understanding of the most problematic component types and calculate the potential yield from a design based on the component technology used.

"One of the nice things about the project is it is unique", said Bob the companies who are involved are steering the project and I have achieved something I have wanted to do for years "Give the People What They Want" as a well known singer once sang.

If you would like to be involved with the project and gain access to all the results and data contact us via info@ppm-monitoring.com or visit the web site www.ppm-monitoring.com where you will find all the documentation and training material.

Bob Willis has been supporting the industry with his links to the SMART Group and acts as their Technical Director of the SMART Group, Europe's largest surface mount trade association. Bob is the PPM Project coordinator for the SMART Group initiative. Bob Willis is also a process engineer providing engineering support in conventional and surface mount assembly processes. He runs production lines for suppliers at exhibitions and also provides seminar and workshops world wide. Bob has one of the largest collection of training videos, interactive CD-ROMs and training material in the industry. Bob will be presenting four Master Classes at APEX in California, he will also be presenting classes at SMT Nuremberg in Germany for those engineers visiting the show. For further information on how Bob may be able to support your staff contact him via his web site www.bobwillis.co.uk

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