TopoQC

Increasing PCB Production Line Yield

Reach effective defect prevention levels through better utilization and analysis of existing defect data throughout all stages of production.

Increasingly complex PCBs drive production costs up while manufacturers are facing constant price pressures. In this environment, it is critical to increase yields and reduce costs. Identification and elimination of defective root-causes early in the production process cycle can have tremendous impact on costs and productivity.

TopoQC enables effective defect prevention in PCB production lines. It illuminates root-causes of defects by providing a powerful graphical analysis tool.

QA Today

The electronic industry is known for its constant struggle to achieve higher levels of quality and yeild. Every PCB assembly line has some mechanism of QA. Most manufacturers invest heavily in QA technologies such as ICT, AOI, JTAG etc. Combined with visual manual inspections QA performed at various stages of production:

- Paste
- Solder /Reflow
- Touch-up
- Functional Test (FT)
- Final Quality Control

QA Inefficiencies

In most operations today, the collected defect information is used solely for repair purposes i.e.: manually fixing specific defects on specific PCBs or rejecting the PCB's altogether depending on the defect.

Obviously, locating malfunctions retrospectively is inefficient and costly both in labor and material.

Defect Prevention

Many of the defects are caused by fixable failures in planning (i.e. wrong shape), technology (i.e. bad mask or SMT) and components (i.e. corrosion). Early identification is necessary so that problems can be eliminated and defects can be prevented. Preventing defects before the PCBs are actually assembled saves material and labor costs.

Effective prevention is hardly achieved today because the analysis of the defects is difficult. Most companies use reports and charts to analyze the data but these methods are too simplistic and limited in helping to unravel many of the causes.

Effective Defect Data Analysis

TopoQC maps defect data to the PCBs components creating a color-coded, thermal-like, map of defects on the PCBs geography.

Figure 1: Color coded defect map

This form of presentation unravels patterns in the defect spread that are otherwise invisible. For example, defects can be concentrated in certain geographic areas due to a damaged mask, inaccurate SMT arm or temperature spread problems.

The color scheme highlights concentrations of defects. Thicker concentrations appear as darker orange/red. Extreme defect concentrations passing a definable threshold (e.g. 15%) appear in a different color (Pink in the picture above).

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It's easy to see how this patent pending presentation emphasizes problems immediately starting from the most trivial (defected component) to the more complex ones.

TopoQC analyses the complete defect picture (as opposed to identifying specific defects on specific boards), leading to a better understanding of the failures causing these defects and enables effective defect prevention.
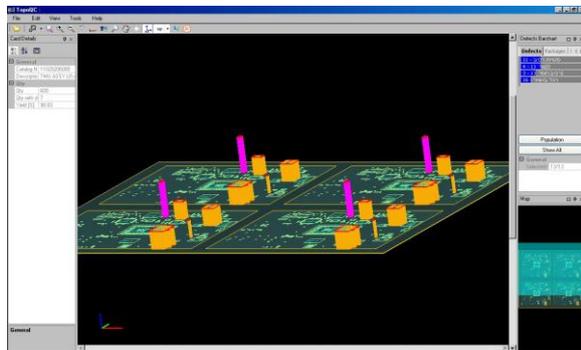

Figure 2: Color coded defect map in 3D

TopoQC calculates DPMO according to IPC7912 and allows viewing and comparing different data populations (like AOI vs. VI, Work Orders etc.).
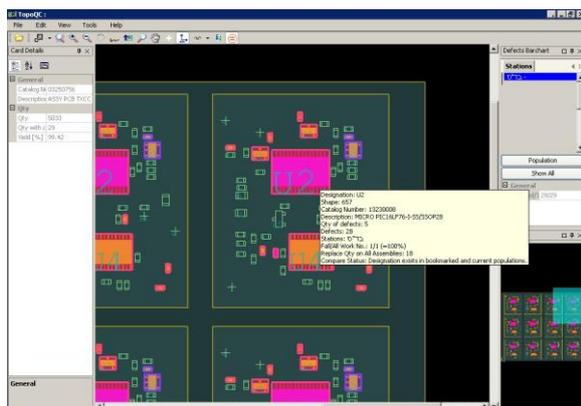

Figure 3: Compare result between AOI and VI

Immediate and Accessible

TopoQC uses two kinds of data as its input:

- Defect data from Quality Systems and Machine Test Results (like AOI, ICT, VMI, JTAG, etc)
- PCB design (Mentor, Cadence, Altium, PCAD, ODB++, GenCAD, Fabmaster, PADS etc) or SMT Setup Information

Since both types of data are highly available at any manufacturing operation, the analysis can be done whenever it is required and at very short intervals. After loading the data to the TopoQC application, the map appears immediately, no work or processing is required. The analysis is therefore immediate and accessible.

Simple to Use

As can be seen from the screenshot herein, using TopoQC does not require any special skills or training and it can be used by production floor or QA workers as well as managers.

Easy to deploy

Apart from the fact that it relies on highly available data inputs, TopoQC requires no special infrastructure. No databases, software or hardware. A simple standalone off-the-shelf PC station is all that is required.

Immediate Results

Since TopoQC utilizes highly available data, requires very little skills or training and almost no infrastructure, it can be up and running in no time. This means that existing defect data from all sources can be analyzed and the effect on production is instantaneous.

Applicability

The following types of organizations can benefit from using TopoQC:

- OEMs with in-house production
- Electronic contract manufacturers (sub contractors)
- OEMs that outsource production (monitor & control).

TopoQC can be used by small as well as large operations. It is applicable and effective for small batches starting with prototypes as well as for mass production. The effort to increase yield is ongoing. It

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starts with proper planning and prototyping but even deep into production, lessons can be learned and process and design can be improved to eliminate problems that appear along the way. TopoQC can assist in any of these stages by illuminating problems earlier.

Summary
- Identification of problems that are otherwise hidden
- Effective defect prevention
- Immediate and Accessible
- Can be performed at factory floor level or by management
- Easy to deploy
- Applicable to any operation size
- Immediate results
- DPMO calculation
- Viewing and comparing different data populations

Business benefits
- Increased yeild
- Lower production costs
- Higher productivity
- Shorter production cycles

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