Two clever software tools make work easier and reduce costs

Better integration between electronic production and testing

The production off electronic boards is generally a linear process: one step follows the other and at the end you can hold the finished product in your hands. But if there are errors along the chain, they are carried all the way to the end. Which is why it's good to discover errors early, because the later in the value creation chain they are detected, the more expensive it gets. Appropriate testing can help. But even better is if the entire production and testing process is monitored by a high-level software package that allows recurring problems to be detected and corrective intervention in the production process be introduced. Such software can also help to get further use out of existing CAD data in the production and testing process, thereby saving time and money.
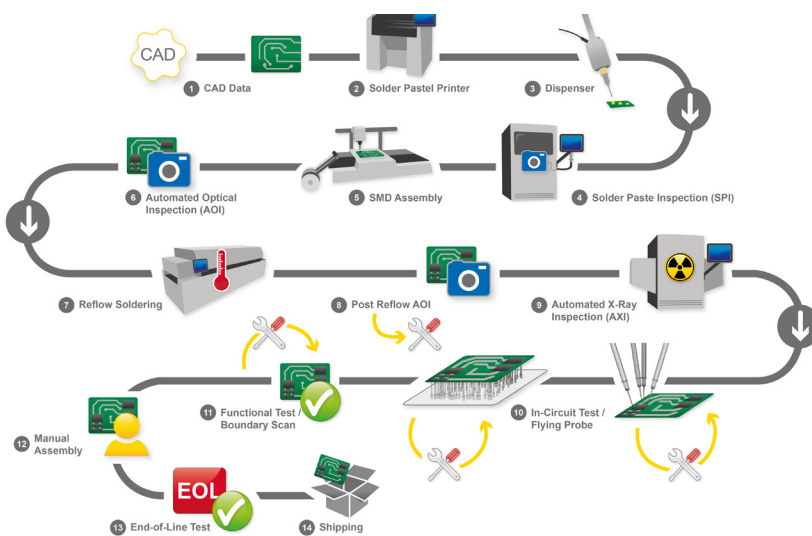

Fig. 1: Typical production and test steps in populating board assemblies (Source: Digitaltest)

Which production and testing steps are involved in the manufacture of an electronic board depends greatly on the complexity and value of the product. All of the following steps may be included or only some of them (Fig. 1): typically everything begins on the PC with CAD planning. Once this is completed, circuit boards are produced. A stencil printer or dispenser then applies solder paste to the boards. After the solder paste inspection they go to SMD assembly followed by automatic optical inspection (AOI) for checking all SMD components. After soldering an additional AOI process ensures that all the solder connections are correct. At this point there is normally a visual inspection station to check for pseudo-defects. Depending on the type of mounted components an X-ray test may be used which can also see beneath the components. Next come the actual electrical tests such as flying probe, in-circuit function and boundary scan tests. In some cases components need to be manually assembled. This manual soldering can take place either before or after the electrical tests. Finally there is the end-of-line test, for example a function, stress or endurance test before the fully inspected assembly leaves the house.

Communication along the value creation chain

During production and the individual tests a great amount of information is generated and stored along this value creation chain. Ideally this information can be exchanged between the individual stations. The experts in electronic testing at Digitaltest have therefore developed two ingenious software tools that can communicate with the common CAD tools and automated equipment for electronic production. CAD data are generated right at the beginning, even before a tangible product is in sight. This data includes important information that is helpful for many steps along the board assembly chain. If the CAD data can be read and further utilized, this facilitates the entire production process and all the testing. This is where the C-LINK DTM software comes in.

Cost savings even with subsequent changes

The software can for example verify CAD data from the planning stage and check in advance whether a special assembly can be tested in automated fashion. It also helps in defining test points. The information obtained can be easily exported for passing on to the manufacturer of the test fixture. In addition, the software assists when changes to the assembly are made by checking which test points are affected by the change and whether an existing test fixture can continue to be used or whether minor modifications are needed. If this information prevents the need for new test fixtures, the financial savings potential is huge, since the cost of test fixtures is often in the thousands or tens of thousands.

Another feature of the software is that it allows the needed information for constructing the solder paste print stencil to be exported and provided to the corresponding vendor. If a dispenser is used instead of stencil printing, the C-LINK software also provides the necessary coordinates. For actual assembly it is possible to generate a neutral assembly file which any common pick-and-place machine can use.

AOIs, whether following the assembly or reflow process, can also profit from use of the software with the original CAD data. This significantly facilitates creation of test programs. The software also aids electronic tests such as in-circuit or flying probe, since it automatically translates the design data from the CAD system for any test systems (Fig. 2). The C-LINK software automatically calculates appropriate coordinates for needles or test points and allows the user to easily output them.
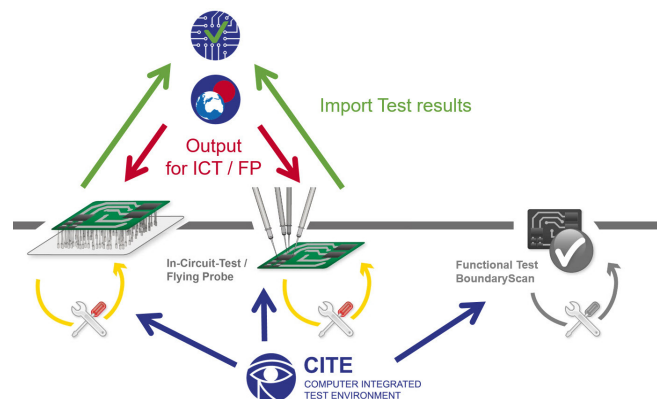
Fig. 2:The CAD/DAM software C-LINK DTM allows CAD data to be used for production and testing, while the QMAN software imports data from these process steps. Shown here for in-circuit and flying probe tests. (Source: Digitaltest)

Closing the loop

Even better is when processes are not only controlled but also loop regulated. For this purpose the experts at Digitaltest have developed a second testing software program called QMAN. This collects the information from the individual production and test steps and feeds it back to the CAD software. For example, it not only imports the test results of the solder paste inspection, but also performs a statistical analysis. If the defects accumulate, cleaning of the stencil may for example be necessary. QMAN then issues the corresponding warning. The software also stores all the results from the following tests: AOI after pick-and-place as well as reflow soldering, X-ray, in-circuit, flying probe, boundary scan and end-of-line tests. The collected results allow a statistical assessment of whether problems keep recurring with certain components. It can well
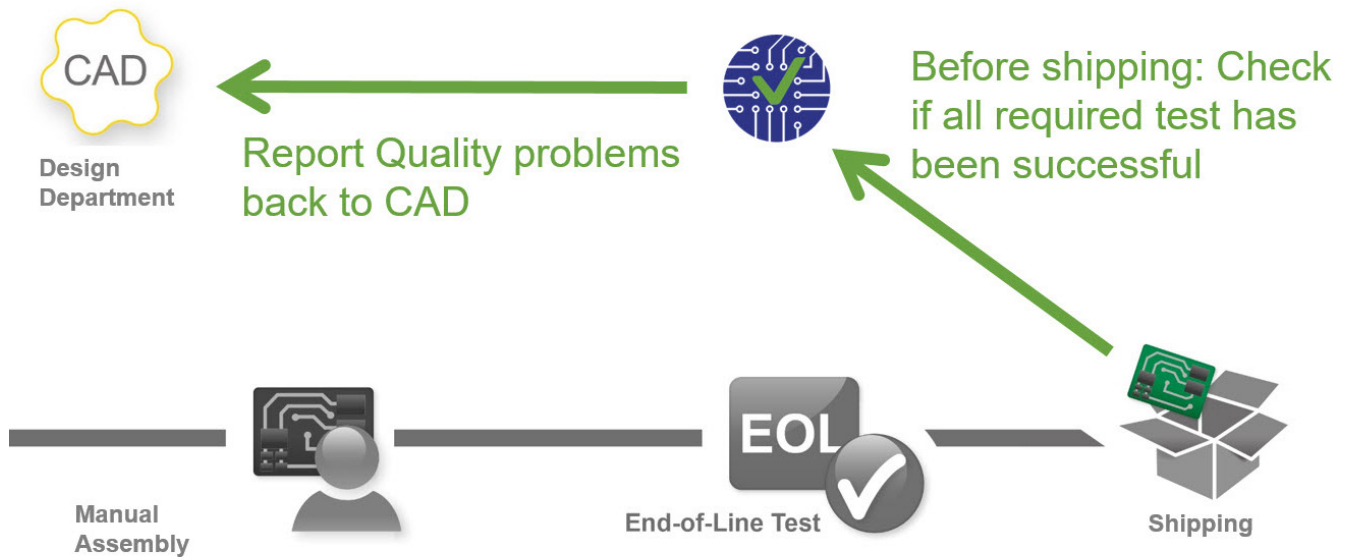
Fig. 3: "Closing the loop": Reports for quality discrepancies are fed back to the CAD. (Source: Digitaltest)

happen that assemblies need to be modified, whether because higher power or less current consumption is required, components are no longer available, or for other reasons. The gathered information can then also be used based on statistical assessments to decide whether a particular assembly keeps having issues and where design changes make sense.

Making tricky repairs economically

This quality-purposed software can also be used as a knowledge management tool, allowing tricky repairs to be documented. If a repair used to be too cumbersome and therefore too expensive due to the effort required, now it becomes economically feasible thanks to be consistent documentation which can be called up each time the same defect occurs. Repair now becomes an economical alternative in many cases to scrapping defective assemblies, which in the final analysis saves precious resources and is good for the environment.

Consistent communication down to the end

It remains true that some assemblies also require manual populating. For these manual

stations the QMAN software generates check lists including information about component placement. After assembly it writes back to the system who installed which components when; important information for traceability. Finally comes the end-of-line test. Since each assembly is uniquely identifiable via its serial number, the software then check again whether the respective assembly has passed through all the necessary production and test steps and whether these were successful. This then closes the "loop" in that the software feeds corresponding reports back to the CAD system (Fig. 3). This tells you immediately where quality discrepancies have occurred and allows you to respond in a targeted manner.

Test devices, software and services from a single source

Many people associate Digitaltest with test systems, but the company offers much more (Fig. 4). Their decades long accumulated testing expertise flowed not only into the described software tools, but also into the CITE software. This is installed on all test devices offered by the company and is used for example for automated test program creation with an interactive debugging interface for the layout and circuit diagram viewer. But services are also part of the portfolio, such as creation of

test applications. Under the heading "Digitizer Service" the company helps in reconstructing missing CAD data. Anyone looking for solutions related to the entire concept of electronic assemblies will find themselves in the best of hands.

Company profile

Digitaltest, experts in automated circuit board testing systems

As a valued partner in the electronics industry Digitaltest has been developing and producing automated test systems (ATE) for electronic circuit boards for electronic circuit boards, software for production automation, and quality management systems for over 35 years. The company is known for its innovative solutions for optimizing manufacturing processes – as an interface between CAD, test procedures and production itself, while also offering comprehensive service and support extending to complete outsourcing of your circuit board tests to our locations worldwide. Software and hardware products from Digitaltest are used in many key sectors, including aerospace, automotive, telecommunications, medical technology as well as industrial and consumer electronics. With more than 2000 installations worldwide the company is a proven partner of industry.

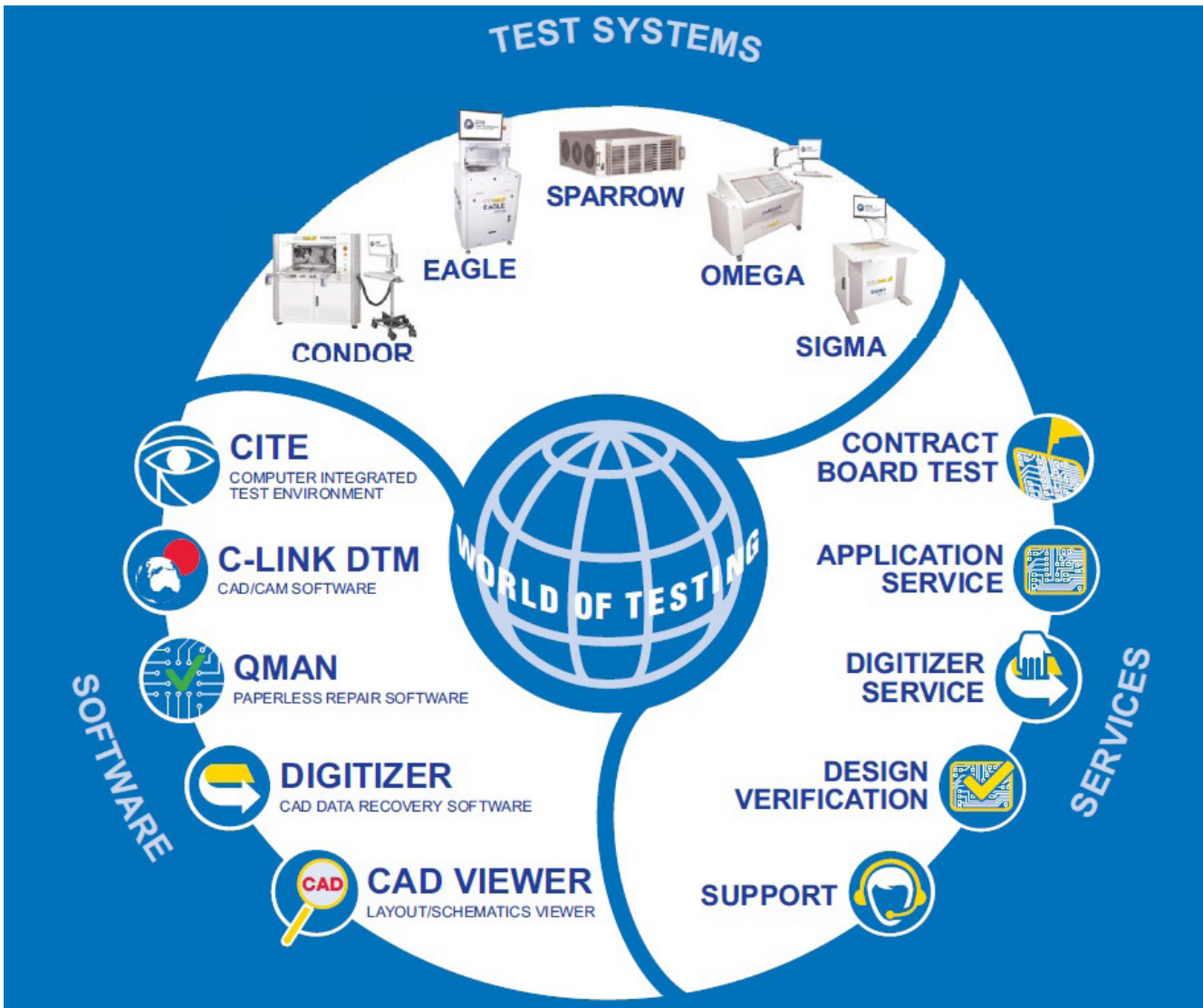Learn more at:

www.digitaltest.com/testsystems/

Fig. 4: Beyond test devices Digitaltest also offers testing software and a variety of services. (Source: Digitaltest)