Optimization of ICT through an in-line test platform

In a world where electronics play a central role, ensuring the quality and efficiency of printed circuit boards (PCBs) has become crucial. Conducting In-Circuit tests is essential to identify potential faults in components and ensure the proper functioning of electronic devices.

This case study focuses on an electronics manufacturing company facing significant challenges in conducting in-circuit tests efficiently and accurately.

1 Test requirements

An ICT (In-Circuit Test) is a testing method used in the manufacturing of printed circuit boards (PCBs) to detect faults in components and in the interconnection between them.

While functional test checks performance, the ICT focuses on verifying the integrity of individual components and the continuity of conductor paths on the PCB.

Some common analysis executed during an ICT include the following:

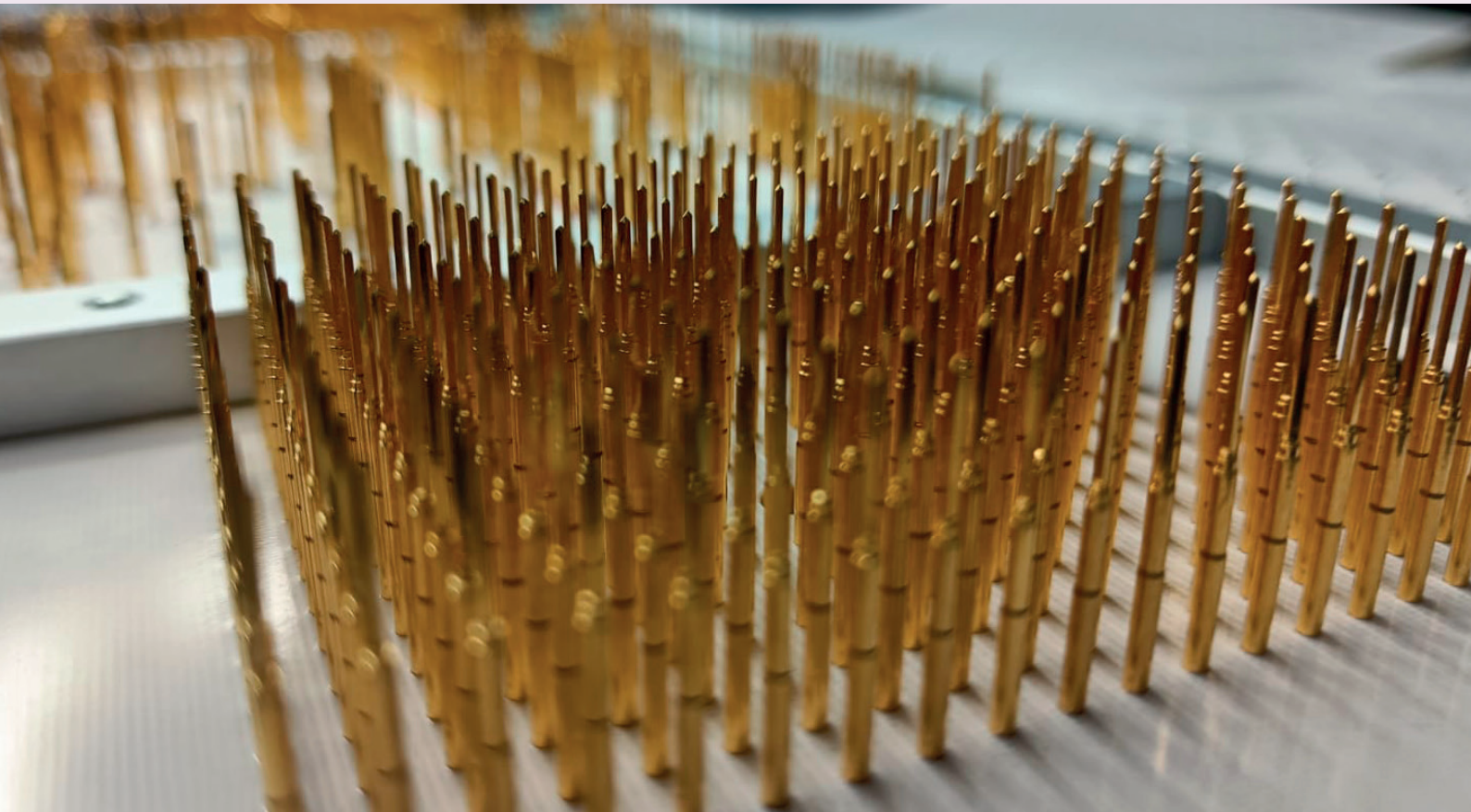
Value tested	Verification
Continuity	Electrical continuity between different points on the PCB to detect short circuits or incorrect connections.
Component polarity and value	Values and polarity of components such as resistors, capacitors, and inductors to ensure they respect the specifications.
Diode and transistor	Diodes and transistors to ensure they are functioning properly and in the correct direction.
Insulation	Resistance between test points and the rest of the circuit to detect potential short circuits or a faulty insulation.
Termination	Termination connections, such as component solder joints, to detect potential solder quality issues.

MTS30 Digitaltest

MTS30 product from Digitaltest is an advanced in-circuit test (ICT) system designed to perform high-speed and high-precision tests on printed circuit boards (PCBs) during manufacturing.

Some of the features and advantages of MTS30 by Digitaltest are the following:

Process	Purpose
High test speed	Conducting tests in the minimum time possible.
Accuracy and reliability	Ensuring reliable detection of faults and issues in PCBs during production.
Flexibility	Verify resistance between test points and the rest of the circuit to detect potential short circuits or a faulty insulation.
Advanced fault detection capability	Identify a wide range of issues such as shorts, opens, resistances out of specification, and more.



2 Challenges when implementing ICT in an in-line test handler

Implementing ICT (In-Circuit Test) in an in-line test handler may imply several challenges.
These are some of the most common ones:

Integration complexity	Integrating an ICT system into an in-line test handler can be technically challenging. It requires synchronization between the ICT system and the handler to ensure smooth operation and accurate testing without causing bottlenecks in the production line.
Space constraints	In-line test handlers often have limited space, making it challenging to accommodate the additional equipment and infrastructure required for ICT testing. Designing a compact and efficient setup within these constraints can be tough.
Handling high volumes	In-line test handlers are designed for high-volume production environments, which means the ICT system must be capable of testing a large number of PCBs quickly and efficiently without slowing down the production line.
Test fixture design	Designing a test fixture that can handle the high throughput and continuous operation of an in-line test handler while maintaining accuracy and reliability can be complex. The fixture must be robust enough to resist continuous use without compromising the test results.
Data management	Managing the large amount of test data generated by the ICT testing in an in-line environment can be overwhelming. It requires efficient data storage, retrieval, and analysis capabilities to ensure that test results are properly registered and analyzed in real-time.
Maintenance and calibration	In-line ICT systems require regular maintenance and calibration to ensure accurate and reliable test results. Coordinating maintenance schedules and minimizing downtime can be hard in a high-volume production environment where every minute of downtime can result in revenue loss.
Operator training	Operators must be properly trained to operate and maintain the ICT system within the in-line test handler. Providing comprehensive training programs to ensure that operators have the necessary skills and knowledge can be time-consuming and resource-intensive.

3 Improvements achieved

After the implementation of the in-line test platform, there are huge improvements in various aspects:

- A 40% reduction in in-circuit testing time, allowing a quicker production
- A 25% decrease in the rework rate due to a more precise fault detection
- Increased flexibility to adapt to changes in PCB design and add new products to manufacturing without significant disruptions

This case study proves how the adoption of an in-line test platform for in-circuit tests can overcome operational challenges, improve efficiency and enhance quality in the manufacturing of electronic devices.

Its successful implementation not only impacts positively on productivity but also strengthens the competitive position of the company in a constantly-evolving market.