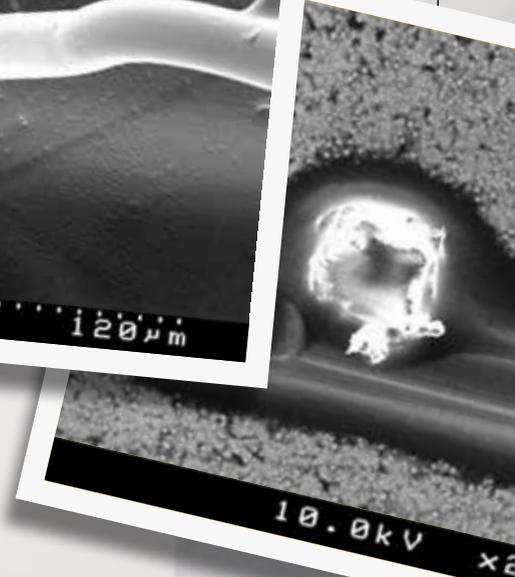


SMART SOLUTIONS FOR YOUR MANUFACTURING AND QUALITY CHALLENGES.

Improve Yield and Reduce Overall Manufacturing Costs

Using SMART Microsystems In-House Expertise and Resources
for **Custom Microelectronic Assembly, Testing and Inspection.**

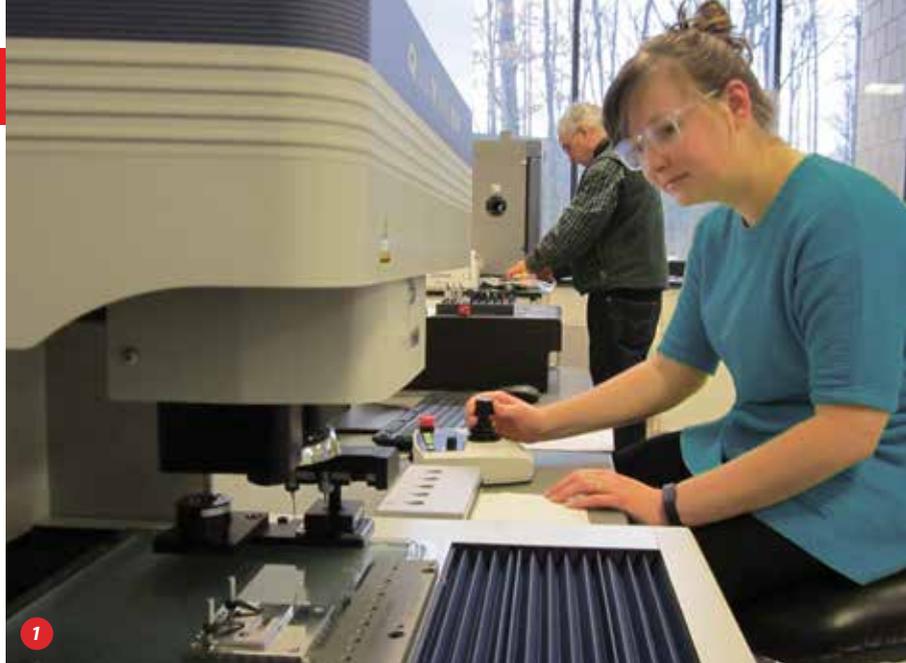


ROOT CAUSE ANALYSIS AND TEST FOR MICROELECTRONIC ASSEMBLIES TO REDUCE COST.

In the world of new product development, **failure analysis** is a valuable tool that can reduce costs and accelerate time to market. Failure analysis can be used to achieve a better understanding of the behavior of a microelectronic assembly after being stressed by the conditions from its application environment. In a thoughtful design, the environmental conditions in which a product is intended to function need to be considered carefully. Once these conditions have been determined, a **life test profile** is defined in order to simulate the environmental conditions in which the product will need to survive. When the life test profile is completed, a **functional test** is performed to evaluate whether the product is still operating according to customer specifications. The next step is to perform **destructive and/or non-destructive analysis** of the product to identify its strengths and weaknesses. Analysis should always be conducted regardless of whether or not there is a confirmed failure.

In this stage of the new product development cycle a **complete “lessons learned” review** is in order. It is important to use all collected data to drive design and process improvements. This aligns with proven new product development strategies such as: **test early, test often** and **concurrent engineering**. The idea is to create early learning using failure analysis results in order to implement improvements before freezing the product design. The results of this “lessons learned” review drive action in the form of a **Risk Analysis, PFMEA, DFMEA**, other six sigma techniques and quality methods. Failure analysis is an effective tool for the development of microelectronic assemblies for new products.

SMART Microsystems' Environmental Life Testing lab and Inspection & Analysis Services labs are available to help you identify reliability issues early in your product development. Our contract testing and inspection laboratories work directly with you to provide testing and inspection solutions that help ensure product quality and reliability. As part of your turn-key product solution, reliability study, or on an as-needed basis for overflow/bandwidth, SMART Microsystems can help solve your equipment resource needs.



COMPLETE CMM PRECISION DIMENSIONAL INSPECTION TO MANAGE INCOMING MATERIAL QUALITY.

As new products and components continue to miniaturize in the growing and expanding microelectronics field, the test and measurement requirements have become more demanding. Finding solutions to these stringent measurement requirements is crucial to maintaining quality products, and to accelerate the design and development processes. Full service suppliers must not only provide microelectronic assembly services, but also perform life and environmental testing, as well as precision measurement, functional testing, and final inspection. Exposure to this full service type of product development creates a unique perspective on the demands and benefits of including precision measurement which can bring added value to a customer. When considering a suite of potential measurement systems provided by a full service supplier – such as optical inspection, CSAM, 3D X-ray, interferometry, and SEM – it is important to be able to measure the smallest detail features with precision and accuracy. For mechanical assemblies used for microelectronic packaging, a coordinate measurement machine (CMM) has significant advantages.



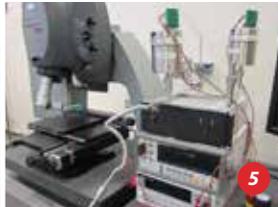


3

DEVELOPING AND EXECUTING TEST PLANS TO **IMPROVE YIELD AND ELIMINATE EARLY LIFE AND FIELD FAILURES.**



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- 1 - Coordinate Measurement Machine
- 2 - Scanning Electron Microscope (SEM) and Energy Dispersive X-Ray Spectroscopy (EDS)
- 3 - Pull and Shear Tester
- 4 - Thermal Shock and Thermal/Humidity Chambers

- 5 - Interferometer
- 6 - High Temperature Storage
- 7 - Environmental Life Test Lab
- 8 - Acoustic Microscope
- 9 - 3D X-Ray
- 10 - Super UV Chamber

SMART Microsystems uses two strategies – **Test Early Test Often** and **Concurrent Engineering** – in order to successfully develop new products that meet market demands. These product development strategies create quicker learning and shorter design cycles. By implementing these two strategies, product development teams can lower overall development time and cost to meet the demands of the microelectronic assembly market.

The **Test Early Test Often** approach to product development addresses the flaws of the traditional product development cycle (PDC). This strategy shortens the overall PDC by employing targeted testing early in the development process. The Test Early Test Often approach uncovers weaknesses in designs by testing fundamental design and process assumptions before too much value is added to the part. In this strategy, requirements for new science are highlighted, potential issues are addressed before they become integrated into the process, and the overall cycle of iterative changes is shortened.

Another strategy to address the pitfalls of the traditional PDC is the **Concurrent Engineering** approach to product development. Concurrent Engineering promotes manufacturable design and reduces overall product development cost by creating synergies between design and process engineering groups. By beginning with the end in mind, this strategy encourages the design engineer to consider the process and the process engineer to consider the design.

Implementation of Concurrent Engineering hand-in-hand with the Test Early Test Often strategy adds real, measurable value. These combined engineering strategies significantly lower overall development time and cost.



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SMART
MICROSYSTEMS™

Innovative Microelectronic Solutions.

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EXPERTISE THAT PROVIDES CUSTOMERS WITH A COMPETITIVE ADVANTAGE.

SMART MICROSYSTEMS is committed to helping customers meet their goals by creating immediate and long-term value. With a management team having over 65 years of collective experience in semiconductors, microelectronics, and sensors, this team's leadership has created a comprehensive set of microelectronic assembly, testing and inspection services for developing new innovative products. This team has a proven track record in new product development where they have been responsible for product launches in a variety of markets, including aerospace, automotive, defense, medical, and industrial controls.

As a leading North American full-service microelectronic supplier, SMART Microsystems has assets and competencies for microelectronic assembly, testing and inspection of custom sub-assemblies. Unlike other suppliers that may only do testing or only do failure analysis or only do assembly, SMART Microsystems has all of these capabilities concentrated in a single comprehensive facility. Our customers benefit from this unique combination of assets as well as the expertise provided by our technical team where they enjoy the SMART team's technical excellence, communication skills, focus on quality, and commitment to solving the most challenging technical problems. As envisioned, this combination of assets and competencies for microelectronic assembly, testing, and inspection brings the value our customers require to maintain their competitive advantage in the marketplace.



SMART MICROSYSTEMS has an experienced technical team, state-of-the-art equipment, and brand-new facilities occupying 15,000 sq. ft. of space, including 5,000 sq. ft. of world-class ISO 6 (class 1000) and ISO 5 (class 100) cleanroom facilities. We are ISO 9001:2015 certified, reflecting our commitment to high quality and continuous improvement.

SMART MICROSYSTEMS™

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SMART Microsystems works with Design Engineers who need high-quality, low volume microelectronic sub-assemblies for their innovative new products. As North America's leading full-service microelectronic assembly supplier, SMART Microsystems takes complete responsibility for custom process development for your new design, taking it from prototyping through launch in less overall time and cost than other package assembly suppliers.

SMART Microsystems is Powered by



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