

Automated Hybrid Assembly Comes of Age

With the increased levels of complexity and spiraling costs in manufacturing, hybrid and MCM manufacturers are increasingly turning to the use of automated assembly lines to integrate several of the component placement, wire bonding and accessory steps.

The resultant improvements in yields, increased throughput, and reduced time to market have made automated assembly lines among the most strategic competitive weapons for reduction of total cost of ownership in the coming decade.

The past twenty years have seen a migration from manual assembly processes to the use of high speed automated assembly equipment, such as automatic wire bonders and component placement systems, to improve process control and throughput for these complex steps.

In recent years many users have formed automated assembly cells by adding input and output magazine handlers to automatically move material into and out of the assembly equipment. This effort has reduced the number of operators required to run the equipment, reduced processing errors, and increased productivity.

Today, many manufacturers are evolving from assembly cells to fully automated assembly lines, which consist of integrating the assembly cells with additional accessory equipment. The illustration in Figure 1 shows one such line which is being used in the defense industry.

In this example, the dispensing, component placement, epoxy curing, and ball bonding operations are integrated together by a conveyor, with input and output magazine handlers at each end. Other processes, such as surface mounting, plasma cleaning and encapsulation have also been integrated.

Relative to assembly cells, this type of automated line configuration enables a dramatic reduction in total cost of ownership. It further reduces the wait time between process steps (e.g. shortened feedback loops and reduced WIP), requires fewer operators, fewer magazine handlers, and further improves process control and product quality, while substantially reducing floor space requirements.

Manufacturers who have successfully implemented such lines have reported significant reductions in their total cost of ownership along with higher yields. In addition, their customers have been especially impressed with the level of product consistency and quality produced by the lines. With the potential to reduce floor space requirements on the order of 20% to 80%, automated lines have become a strategic means of adding capacity without building new factories. Lines are now in production in many industries, including the automotive, telecommunications, medical, and defense industries.

Such advanced levels of automation have introduced several challenges to manage. Short product life cycles and rapid time to market demand that the lines be sufficiently flexible to handle parts with odd form factors, frequent design changes, and variations in product volume and mix.

A high level of expertise and experience are required to design the line layouts, develop the material handling schemes, and manage the process integration challenges. For these reasons, plus the initial high capital outlay and risk of time to market delays, many hybrid manufacturers have been reticent to undertake the risk of introducing automated lines.

Fortunately, there are now equipment suppliers who are experts in providing turnkey automated line solutions. Typically these suppliers manufacture the most complex pieces of processing equipment themselves, such as the wire bonders and component placement systems.

They provide their expertise to advise which accessory equipment is compatible with the hybrid manufacturer's process, and handle the complete design, installation, testing and support tasks consistent with the products' specifications. In addition, they obviate the need to hire specialized engineering staff and reduce the attendant risks of delays in delivery and implementation.

Choosing experienced suppliers with proven track records of successful line design and implementation is critical and is the key to lowering risk and obtaining the cost, yield and productivity benefits of automated lines.

In the battle for market share and profitability, advanced technology has presented both obstacles and opportunities for leading edge hybrid manufacturers. The coming of age of automated assembly lines holds the promise of being among the most powerful weapons for improving profitability going into the next decade... By Bruce Hueners Palomar Technologies.