Advanced Packaging Loves NY

Or Burning Down the House

By Françoise von Trapp, managing editor

Our latest Roadshow took us to the rolling hills of New York State for adventures that would have made Thelma and Louise proud. Despite the GPS system in Kathy Poggi's car, we still managed to veer off-course a few times. The first hotel we were booked into was so seedy-looking, we drove away, frantically dialing our cell phones to find better lodgings. The next morning started late, because Kathy's new car was keyed during the night, so the police had to be brought in.

Our visits the first day took us to Endicott Interconnect, in Binghamton, NY, the birthplace of IBM. Here we learned about build-up organic substrates that will revolutionize military, aerospace, and medical electronics with their thin, low-profile, lower-cost, and increased electrical performance. Next, we visited Universal Instruments, and heard about the company's restructuring plans, the launching of Unovis, and the work the SMT Packaging Laboratory is doing under the watchful eye of George Westby.

After an educational and interesting day, we made up for the mishaps of the night before, beginning with a block party at the Utica Club Brewery, where we met up with Rick Short, of Indium. Rick introduced us to the raucous nightlife of Varick Street. We made our way from the brewery, past a creatively named hotdog stand for a photo opportunity, danced with the Varick Street Buskers, and ended up at Café Fianchetto's, a lovely Italian restaurant which we accidentally almost torched when a napkin left too close to a tea-light candle caught fire. Thinking quickly, Gail grabbed the flaming article, tossed it on the wood floor, and stomped it out with her sandaled foot. Needless to say, there's never a dull moment on the Roadshow circuit. However, we got right down to business the next morning and learned all about Indium's latest products, including their thermal interface materials and solder preforms.

Endicott Interconnect

When Endicott Interconnect spun-off from IBM Microelectronics, their organic build-up substrate was just being developed. IBM chose to keep the ceramic technology line, and Endicott Interconnect acquired the HyperBGA line.

Ceramic substrates have a different coefficient of thermal expansion (CTE) than the PCBs they are mounted on, and are more apt to fail in high-speed applications. The HyperBGA material expands and contracts at similar rate as the board, making it a good alternative for applications where high speed, reliability, increased signal I/O, and overall package size are critical. This has turned out to be a very good thing, noted Vernon K. Wells, marketing specialist at Endicott International, especially for military and medical electronics, which are two of EI's target markets.

Jeffrey Knight, VP business development and strategic planning, discussed EI's plans for global expansion. "We're growing from just an Endicott footprint to being more global," he said. Part of that includes a manufacturing capability in Shenzen, which is scheduled to be operational this year, and another in Shanghai, opening early in 2007. Knight said the plan is to continue with R&D and early production in Endicott, then turning volume production over to Asia.

Another area EI has become involved with is thin-film roll-to-roll electronics manufacturing material with embedded passives, which will allow the military to wear displays in the fabric of their clothing, along with other interesting applications. Endicott Interconnect has been working with the United States Display Consortium (USDC), Binghamton University and Cornell University on this project as part of the Center for Advanced Microelectronics Manufacturing.

Mark Ponzi, semiconductor manufacturing operations manager, took us on a comprehensive tour of the whole build-up substrate process. He explained that the HyperBGA is a sequential build-up product that goes through 7 circuitization steps and 6 lamination steps to create a panel that then becomes BGA substrates. Because they are dealing with very thin foils, handling and cleaning is a big concern. All the layers go through a water wash and electrostatic discharge cleaner before going into the cleanroom.

The lamination process involves high-pressure electric presses that create books of layers in six steps.

Our tour continued on through the copper-plating line, plasma cleaning, process control, and optical test areas. Optical testing is performed manually and defects are sent to the verification station so that shorts can be repaired as they are discovered, explained Ponzi. Our next visit was with John Kresge, senior engineer, who demonstrated laser via drilling and singulation that creates final high-performance chip carriers. This process is unique to EI. Rather than traditional mechanical routing, laser singulation yields 20% more pieces per panel, Kresge explained, and high-aspect ratio thru-hole drilling achieves 330-mm 50-µm vias — the size of a human hair. Finally, Paul Hart, lead engineer, and Vic Barba, director of engineering, demonstrated the first-level assembly line, where modules are assembled.

In the end, we met with James J. McNamara, president and CEO, who showed us some of the medical products for which the company supplies special packages. "We have been Endicott Interconnect for three years now, and we're doing well," said McNamara. "You do a good job for one firm, and the word gets out that you can handle the challenges of miniaturization." One package — a thin-film rolled disposable device that fits into a catheter for performing diagnostic testing — was reminiscent of Fantastic Voyage, the medical science fiction movie from the '70's.

Figure 1. Endicott Interconnect welcomes the Advanced Packaging Roadshow crew. Back row, left to right: Vernon Wells, marketing specialist; James Fuller, VP and general manager, PWB and semiconductor packaging; Jeffrey Knight, VP business development and strategic planning. Front row, left to right: Mark Ponzi, semiconductor manufacturing operations manager; Theresa Taro, director of marketing and communications; Kathy Poggi, associate publisher; Gail Flower, editor-in-chief; Meredith Courtemanche, assistant editor; and Françoise von Trapp, managing editor.

Figure 2. Display of EI's HyperBGA lamination layout diagram of the steps to create a panel that then becomes BGA substrates.

Figure 3. In the cleanroom, Nicole Swick, technician, removes any final particles from the material.

Figure 4. In the mini-lab Ron Whitney, plating technician, performs an analysis of plating baths.

Figure 5. The birthplace of IBM, in Endicott, NY.

Figure 6. James McNamara, president and CEO, greets Gail Flower.