

# The Electronics Industry Going Forward

**T**he time has arrived to address the outlook of 2006. This column looks at market thrusts and technological trends, as well as selected areas in semiconductor, PCB, board-level assembly, green manufacturing, and other manufacturing and business sectors.

## Globalization, Market, and Business

Globalization, market push, global competitiveness, and shortening life cycles of electronic gadgets have been driving technological developments. Environmentally friendly manufacturing and the delivery of benign end-use products have become essential to business competitiveness. In this era of globalization, innovation, the ever-swift information flow, the new-knowledge generation, and the way information and knowledge are used will fuel the economy. Producing more with less people at a lower cost is imperative, making increasing productivity a relentless target. To move scientific knowledge and discoveries from the laboratory to the manufacturing floor, and to the marketplace, practical knowledge and entrepreneurial spirit are the niches of the workforce. I would expect the dynamic among the three continents remains fluid. All three continents are expected to face fierce competition across boundaries.

Raising the intellectual bar and moving up the technology curve constitute the backbone of the corporate and national strategy. In the long run, innovation and

competitiveness are key to a constantly rejuvenating economy.

As a 12-member Globalization Committee appointed by the National Research Council, we have the privilege to assess the impact of the globalization on the current state of materials science and engineering, the U.S. economy, and national security. The findings, conclusions, and recommended actions for all industries have been published.

## The Role of China

As for electronic hardware on the global marketplace, my 1997 column offered a sketch of the industry in China:

*"...China was poised for the speedy development of the electronics industry... With all the challenges and developments, one thing that could not be ignored is the market power of the world's most populous country. ...For the electronics industry, opportunities in this burgeoning market are abundant."*

In my 1999 column, "Evolution of SMT Manufacturing in Southern China," I noted that Chinese engineers and technicians were well positioned to work with SMT manufacturing. As anticipated, the China market was the bright spot last year, enjoying both export and import growth, increased industrial output, and 8 to 9.5% GDP. This market will continue to grow throughout the electronics hierarchy, and will expand its role as the global manufacturing center. With its internal market size, export capacity, low-cost labor, increased technological development, and entrepreneurial zeal, China will be the bright spot again this year.

## Exciting Technologies

Expanded silicon technology (SiGe and silicon photonics), 300-mm wafer, finer-than-65-nm circuitry, and increased efficiency of subsequent interconnections in packaging and PCB levels are enabling technologies. With continued development in these areas, the market demand for lower cost, higher speed, lower power consumption, and concurrent capabilities of digital processing and analog RF broadcasting will be fulfilled.

The convergence and integration of electronic functions demand further development in electronic circuits. Technological

advancements required include the need for semiconductor material with expanded silicon technology to produce low-cost and high-performance products, as well as printed circuit material with controlled CTE, moisture resistance, reduced impedance, increased dimensional and thermal stability, and low cost. These materials and processes aim to eschew heat-related damage during manufacturing, reduce environmental impact, and lower energy consumption. Nanotechnology that embraces material fundamentals and pragmatic knowledge will come into play.

This article cannot conclude without mentioning lead-free electronics as both the EU's and China's RoHS legislation will become effective this year — albeit each having a different enforcement date. In a practical sense, the industry needs to start producing lead-free electronics. The biggest challenge is the confusion of disparate information and lack of integrated knowledge. Much perception, notion, fragmented information, misunderstanding, and hearsay still are prevalent. The success of making the lead-free conversion relies on the ability to separate sound knowledge from casual remarks, and keep an open mind. The old saying, "The test of a first-class mind is the ability to hold opposing views at the same time and still retain the ability to function," says it well. When implementing a new manufacturing system, the success is built on the combination of solid technological fundamentals, real-world manufacturing know-how, knowledge of options, and an understanding of the pros and cons of each option. Only with that will a right choice be made. To date, much success by many operations has been achieved. We look to a great and exciting year

SMT



**"Raising the intellectual bar and moving up the technology curve constitute the backbone of national strategy."**

Jennie Hwang, Ph.D., an SMT Advisory Board member, has been elected to the National Academy of Engineering, inducted into the WIT International Hall of Fame, and named an R&D Stars-to-Watch. She is a member of the U.S. Commerce Department's Export Council and serves on the board of Fortune 500 NYSE companies. She is a speaker and author on trade, business, education, and social issues. Contact her at (216) 839-1000; e-mail: JSLHWANG@aol.com.