Circuit Technology

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PC Fabrication: 1996

Those of you who have been reading *P&SF* for many years may remember that this column was previously titled "SMT Topics" (June 1991–December 1993). It was designed to acquaint PC fabricators with the opportunities currently available for expansion as a result of surface mount technology. The name of the column was changed to "Circuit Technology" in January 1994, to emphasize improvements required to expand the market for interconnect systems on organic substrates.

A Brief Review Of the Electronic Industry

The June 1992 "SMT Topics" column stated: "The electronic industry is a complex industry where America is strong in software, but weak in manufacturing. The goal of 'SMT Topics' is to address the issues crucial to revitalize this industry.

"The traditional PCB industry faces the following challenges that must be addressed: Global competition, environmental pressure, competing technologies, and perpetual shrinking of circuit dimensions.

"This necessitates total commitment to satisfy the needs of customers. The decade of the 1980s required numerous improvements in quality to meet the demands of SMT. The 1990s will dictate further improvements to incorporate the advantages of hybrid circuits and MCMs on PC boards. The recharging of the PCB industry is totally dependent on convincing designers that PCBs can economically provide essential properties to incorporate these new technologies."

PCB Market Update

In January 1996, this column reported: "At the recent IPC Technical Marketing Research Council (TMRC) meeting in New Orleans, the conference floor was buzzing with comments about continued success and tremendous growth of the PCB market."*

Reasons for Optimism

The growth of the domestic printed circuit market has resulted from PC fabricators' satisfying the needs of advancements in component technology. Challenges facing the industry in 1992 were addressed as follows:

Global Competition—Advanced component technology for more complex PCBs has limited offshore production in favor of domestic manufacturing. By providing a product containing properties for recent developments in component technology and attachment techniques, the domestic PWB industry has prospered.

An emerging market for worldwide electronic products has also created a need for less sophisticated PWBs,

* W. Foran, "PCB Market Update," *Printed Circuit Fabrication Magazine*, pp. 52–54 (Jan. 1996).

which offshore manufacturers could satisfy without significant investments in new equipment.

Environmental Pressure—By improving communication with EPA and OSHA regulators and developing new processes without well-known toxic chemicals, the negative image of the PWB industry as a "polluter" has been shifted to one of "pollution minimization progress." AESF Week has its well-established Pollution Prevention Conference to disseminate current information on regulations, while outlining processes and equipment for waste treatment and waste minimization. For 17 years, this forum has been instrumental in improving communications between regulators, manufacturers and suppliers.

Concerned manufacturers, trade/supplier associations, and technical societies recognize the need to sponsor awareness groups to improve the image of PC fabrication by making legislators aware of the industry's progress in eliminating pollution and improving health and safety.

Competing Technologies—Printed wiring boards have emerged as a formidable competitor in the sophisticated electronic market formerly reserved for hybrid circuits. PC fabricators have made improvements enabling them to compete as an interconnect system with hybrid circuits.

The cold war demise—with the subsequent decline in the defense industry—precipitated a vast increase in commercial electronics that was sharpened by the global emergence of a demand for electronic products. The accompanying cost advantage of organic substrates vs. ceramics is significant.

Perpetual Shrinking of Circuit Dimensions—Ever-increasing packaging density is required to maximize advancements in component technology. Today, PWBs are efficiently manufactured with finer lines, narrower spaces, smaller vias, and thinner multi-layers, which were anomalous only three years ago.

In addition, selective surface finishes have enabled assemblers to employ the techniques essential for effectual attachment of assemblies containing a variety of IMCs and SMCs (standard/fine/ultra-fine pitch). These improvements have permitted organic substrates to meet the higher circuit density demands of the industry, at a cost that motivates market expansion far beyond original expectations.

Current Capabilities

Here is a list of "leading edge" improvements in PWB capabilities that will satisfy industry requirements:

- Finer lines—0.127 mm (0.005 in.)
- Narrower spaces—0.127 mm (0.005 in.)
- Smaller vias—0.305 mm (0.012 in.)
- Thinner multi-layers—8 layers, 0.635 mm (0.025 in.)
- Selective coatings—OSPs, Ni/Au-Ni/Pd—Flat; Sn/Pb—HASL

Continued progress will promote expansion of the use of PWBs well into the new century. *P&SF*