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May 2003

semiconductor

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 An Angel Business Communications Ltd publication



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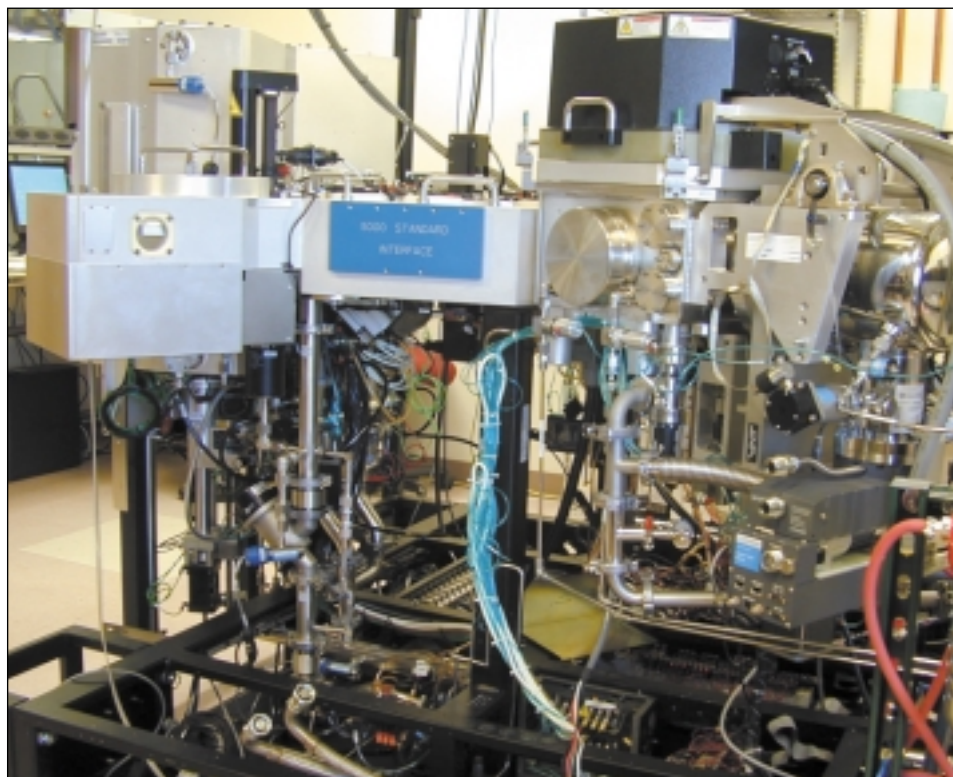
Future trends in integrated systems... change the view

THE FOLLOWING IS AN OPINION PIECE BY **WILLIAM W SAYLOR** OF ADVANCED ENERGY. THE ARTICLE DESCRIBES THE MOST SIGNIFICANT BENEFITS TO BE REAPED FROM AGGREGATING MULTIPLE, BEST-OF-CLASS COMPONENTS INTO A SINGLE TIER-ONE SUPPLIER

Over the past year, the industry has seen interesting and important shifts occurring in the merger and acquisition activities of subsystem and component suppliers. The implications are clear and progeny from that activity will be highly beneficial for all levels of the semiconductor industry

What is the world coming to? Times of great change and uncertainty make one look to the past for historical figures that had the foresight, prescience or dumb luck to articulate one of those pearls of wisdom that is repeated with profundity whenever the future is shrouded in mystery. Clausewitz described the “fog of war” and Yogi Berra proclaimed it was merely “déjà vu all over again”. The most apropos comment may be from that celebrated athletic coach of gridiron lore, Buddy Ryan, who proclaimed, “If you ain’t the lead dog the view never changes.” The unchanging, component-centric view of the industry that has been the supplier’s constrained vision is evolving in ways that reflect disruptive changes exhibited by maturing industries. Consolidation, aggregation and decimation at higher tiers of the market mandate changing product offerings from the bottom.

Success for suppliers has come from satisfying the OEM customer, which means being a technology provider and meeting customised requirements for features demanded by OEM engineers. The competitive nature of the industry supplier base is driving those component performance attributes to commodity features that compete on price. The reward for each increment of technological improvement is diminishing returns on investment. Providing only components to the OEMs is an unchanging view with margin-sapping consequences - for both the suppliers and the OEMs. More



importantly, this strategy deprives the OEM toolmaker and fab process engineer of the capabilities that are enabled by the use of carefully integrated subsystems.

Changing the view by providing function-enabling integrated product offerings makes the OEMs more competitive and better able to meet future demands by increasing tool performance, while reducing the total capital costs for the OEM and cost of ownership for the end user. The OEM spends fewer scarce resources on unnecessary systems integration and parts purchasing - and the fab gets greater flexibility to meet changing market demands.

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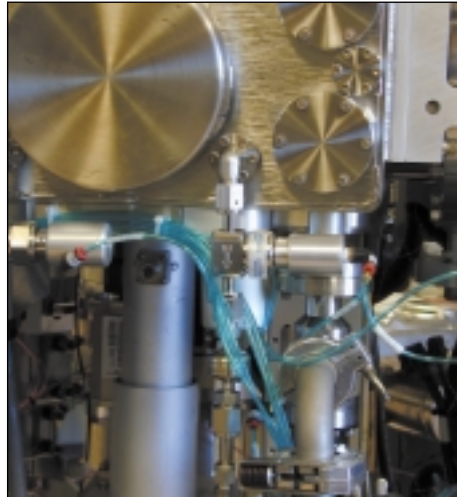
Fabs: shift to the left, shift to the right, stand up, sit down, fight, fight, fight!!!

The time it takes to build a multibillion-dollar fab and select the equipment is now longer than most chip product lifecycles. Reminiscent of the drivers for the growth of the steel mini-mills in the 1970s, fabs of the future will be successful when they can maintain high throughput while making multiple runs of different chips at small lot sizes. Rapid recipe changeover, fast process qualification, increased fault diagnostics and inherently flexible operational capabilities of the tools will be attributes valued by the fabs as they swim through turbulent waters.

Many industries have faced the same dilemmas of a changing supplier-OEM relationship. The most successful automobile companies are those that saw suppliers as partners, rather than merely vendors and used the full talents of the suppliers in the design stage of new platform development. Issues of intellectual property ownership and maintaining a competitive environment for the OEMs have been resolved and the result is better-engineered systems, faster time to market with more technological innovation and a strong and vibrant tier-one supplier base. That same situation must evolve to develop and produce the next generation chipmaking tools for a healthy semiconductor industry.

OEMs: You want how much tool in a five-pound bag?

The rhetorical question posed by the OEM to the fab customer is: "Do you really want ten pounds of stuff in my five pound bag?" The traditional model of building tools piece by piece places an ever-increasing burden on the OEM's system engineering and purchasing departments. The system engineer has an idea of what the tool should do to satisfy the process engineers and scientists, but is constrained in reaching an optimal solution by mixing and matching components and capabilities and hardware and software interfaces. Negotiating with multiple piece-part vendors requires unsatisfying compromises and the generation of numerous purchase specifications. The number of redundant enclosures, power converters, supporting racks and fixtures adds costs without adding value. In the old model, the only way to reduce costs is to beat on the vendors who are already supplying commoditised components and desperately



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hanging on to diminishing margins - and that causes a reduction in product development dollars. The solution is the functional and physical integration of components into subsystems whose value greatly exceeds the cost of parts.

Integrating systems: add value not cost.

Integrating the physical components into complete systems allows for design and development of modular pieces that reduce manufacturing costs, increase reliability and remove redundant materials.

The customer eliminates internal system engineering, procurement and test and assembly costs. Functionally integrating the components into complete systems enables functions, such as fault diagnostics, virtual sensor and advanced process control by providing the information and control hooks for the customer. The functionally and physically integrated systems don't limit the toolmaker; they permit the tool process engineer to explore new ways of sensing, operating, controlling and operating the complete tool. These capabilities for OEM and fab customers enhance tool throughput and process repeatability. The direct cost of all the components can go down with significant increases in capability.



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