

update

EXPANDING MARKETS • IMPROVING ACCESS

The Future Depends on an Agile Fab



BY MIKE SPLINTER,
 APPLIED MATERIALS

The dynamic semiconductor industry produces great new opportunities together with great new challenges. Perhaps most significantly, I see an opportunity for companies across the industry to move forward together and introduce innovative solutions to dramatically enhance factory productivity and sustain industry economics for years to come. But we must commit now and act decisively.

Two years ago, a study commissioned by the board of directors of SEMI confirmed what we all sensed: there is a research and development funding gap at both equipment suppliers and chip makers, with limited resources available to invest in developing future technology. The study called for suppliers and fab

“WHAT THE JPWG UNCOVERED IS THAT THERE ARE SIGNIFICANT OPPORTUNITIES FOR IMPROVING PRODUCTIVITY THAT WERE NOT BEING EFFECTIVELY ADDRESSED BY EQUIPMENT MANUFACTURERS AND FACTORY MANAGEMENT.”

—MIKE SPLINTER

owners to work together to prioritize investments and approaches to maximize innovation with a limited pool of R&D. Since that time we have seen a number of dramatic shifts play out. Major companies are joining R&D consortia or moving to have their R&D done at foundries where the economy of scale on R&D spending is more highly leveraged and amortized across a larger base of wafers.

Against this backdrop, SEMI and ISMI founded the Joint Productivity Working Group (JPWG) in late 2005 to analyze and draw conclusions on the best way forward. The JPWG examined how the industry could maintain the pace of technology innovation and adoption while sustaining industry economics.

Detailed analysis of future fab scenarios by the JPWG reaffirmed that

CONTINUED ON PAGE 2

SEMI® Customer Satisfaction Survey Members Speak Out on SEMI Goals and Performance

3

SEMI Advocacy Member Efforts Yield Results in United States And the World

4

Passion and Perseverance Global Standards Efforts Yield Business and Personal Growth

8

SEMI PERSPECTIVE by Stan Myers, president and CEO, SEMI

Many in the industry agree that economics, as well as technical challenges, will be a future barrier to technology advancement. The challenges we face in funding device scaling and materials advancements have sparked another debate, namely a proposed transition to 450 mm wafers. It has been estimated that the cost of the 300 mm wafer transition was \$12 billion, with the investment spread over the 1996 to 2003 timeframe. As we look at a transition to 450 mm, it appears that such a transition could take as long as eight years to bring to market, and according to some industry

estimates could cost well over \$20 billion.

The difficulty with this debate is that most suppliers feel they have yet to recoup their investment in the 300 mm transition. Additionally, industry experts agree that existing and planned 300 mm fabs are currently operating below their optimum performance. A move to 450 mm at this time would not only diffuse efforts to improve the performance of 300 mm fabs, but also create competition for limited R&D funding.

Many in the industry, including SEMI, support an approach that is designed to

maximize the efficiency and lifetime of existing platforms. The “300 mm Prime” concept, first coined by ISMI and still being fine-tuned in terms of its definition, is aimed at maximizing the return on the industry’s existing investment in 300 mm wafer fabs. We believe this approach is also more suited to the requirements of the market today. The shift to consumer-driven electronics has resulted in a short run, high product mix for fabs. These requirements are better served by more productive use of existing 300 mm fabs.

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CONTINUED FROM PAGE 1

the industry moves forward based on the rate of adoption of advanced manufacturing technology node after node. Sustaining the pace of adoption of such advanced technology requires the entire industry to make some difficult—yet necessary—decisions on how to best invest for future growth.

The analysis concluded that there is not a productivity crisis in fabs and foundries today. What the JPWG did uncover is that there are significant opportunities for improving productivity that were not being effectively addressed by equipment manufacturers and factory management.

Fab operations are very complex, with hundreds of steps and process loops resulting in many factors that restrict the flow of products through a fab. The key to unlocking productivity and significant manufacturing benefits from cost to yield can come by enabling wafers to move through fabs faster, more efficiently, and with fewer bottlenecks. Our historical focus on efficiency has pushed us to sacrifice cycle time for equipment utilization—to the point where wafers spend significantly more than half the amount of time in the factory *waiting* to be processed. With better equipment, yield, and process reliability, it seems like an ideal time to look at how we can get those wafers moving.

Fab agility is an untapped lever that can help us all sustain industry productivity trends. Historically, the push for reduced cost in a fab put pressure on cycle times, and today's increased mix of consumer products only increases the need for speed. At the same time, the complexity of processing technology requires a very short response time to corrective action. Both of these requirements can be addressed—in a cost-effective way—through improved agility so that wafers can move through fabs much faster.

We call this new approach to fab productivity “300 mm Prime.” There is a big opportunity in 300 mm Prime that can be a win-win for the entire



industry food chain. At Applied Materials, in addition to providing leading-edge process technology, our goal is to help customers reduce cycle time and lower the cost of operation by focusing on three areas:

1. *A move to a smaller and more variable lot size to enable shorter cycle times for small lots—including single-wafer lots, which would give the fab more of a production-line feel;*
2. *Making equipment more predictable, reliable and controllable, so that a wafer will get exactly what it needs when it needs it; and*
3. *Rapid, high-throughput automation for faster delivery of wafers to waiting tools and chambers.*

Our modeling suggests that a concerted effort on these three fronts can reduce a fab's normalized cycle time by 30% to 70%, depending on product and process characteristics. These benefits can accrue to many different types of fabs—green field as well as upgrades, memory as well as logic, high-mix as well as low-mix product environments.

In the race to deliver new fab productivity, the vision of short cycle times and an agile fab—at competitive cost of operation—will drive

Applied Materials' efforts. I believe that an increasing number of fab owners and equipment manufacturers share this view.

This is a significant opportunity for the industry, and all of us—fab owners and equipment suppliers alike—should commit to this goal and move forward to begin to roll out these capabilities into production fabs within two years.

The work of SEMI and ISMI was critical in bringing the JPWG together as an effective way to engage materials and equipment suppliers together with fab owners to challenge some long-held assumptions. By aligning priorities, SEMI members can develop their own solutions to fab productivity challenges and add value through their own IP, research and development, and production capabilities. Once we have a shared vision, we can move on to do what we each do best: compete to develop winning technologies—making the next “killer app” more exciting and viable, and moving the entire ecosystem forward. The future of the industry hangs on the ability to get this right. It is time for 300 mm Prime.

Mike Splinter is president and CEO of Applied Materials, Inc.

NEARLY ONE-HALF OF ALL SEMI MEMBERS PERCEIVE AN IMPROVEMENT IN OVERALL SEMI PERFORMANCE COMPARED TO A YEAR AGO, WITH ONLY EIGHT PERCENT PERCEIVING SOME DETERIORATION IN PERFORMANCE, ACCORDING TO THE RESULTS OF SEMI'S ANNUAL MEMBER SURVEY.

SEMI CUSTOMER SATISFACTION SURVEY RESULTS

Each year SEMI conducts a customer satisfaction survey to provide essential feedback that ensures continuous improvement on SEMI product quality, services and member satisfaction. For the 2007 survey, more than 1,800 responses were received from every region in the world, giving the survey strong statistical significance.

The main objectives of the study were to determine key drivers of SEMI satisfaction and priorities for improvement. In addition to evaluating the association's tactical performance on managing events, delivering market research and other areas (the "how is SEMI doing" question), the survey also asked members to provide input on strategic priorities (the "what should SEMI be doing" question).

The 2007 survey found that expositions and conferences, industry research/statistics and the SEMI International Standards were the most valued activities of SEMI and the most well-received.

An important finding in the survey was the dramatic improvement in satisfaction with SEMI customer service. Partly as a result of past surveys, SEMI customer service activities have seen staffing changes, increased oversight, and specific corrective actions. These yielded a 22 percent increase in total customer service satisfaction in 2006 over the previous year.

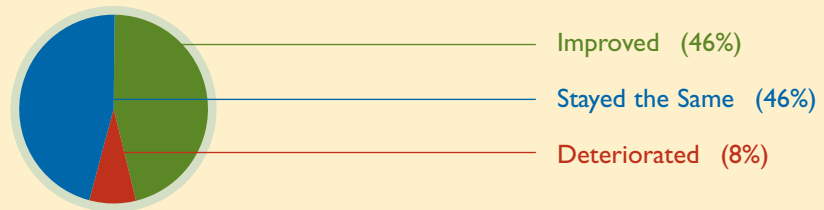
Based on the survey results, two important areas are targeted for improvement in the coming year. The first is SEMI product and service quality, including SEMI events, industry statistics and the SEMI website. SEMI will undergo comprehensive quality audits consisting of improved transactional surveys and "member quality briefings" in order to develop specific redesign, reengineering and other actions to improve product quality in the coming year.

The other area of improvement to receive priority is SEMI communications.

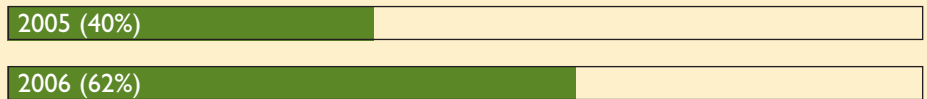
While member satisfaction with SEMI communications increased last year, SEMI would like to improve even further. Members have indicated they want quality information that helps them with their business and they want more targeted information. Plans are

already underway on a variety of fronts to improve the access, delivery, thoroughness, and accuracy of SEMI information and the feedback communications that will drive improvement on all SEMI services to members.

MEMBER PERCEPTION OF SEMI PERFORMANCE OVER THE PAST YEAR



SEMI MEMBER SATISFACTION WITH SEMI CUSTOMER SERVICE



Source: 2006 SEMI Customer Satisfaction Survey

SEMI NANOFORUM SUCCESSSES AND ADAPTATIONS

"SEMI NanoForum was a great place to meet people and to network with industry leaders in cutting-edge semi and in nanotech," says Jonathan L. Tucker, a lead marketing engineer for nanotechnology, research, and education with Keithley Instruments of Cleveland, Ohio, and a member of the SEMI Nanotechnology Steering Committee.

SEMI NanoForum, launched in 2004, was developed to bring together the nanotech community and SEMI member companies. This forum has helped these two diverse groups identify common ground and potential opportunities. But with all the other nanotech shows, SEMI and the steering committee adopted a 'nano to SEMI and SEMI to nano' approach. Rather than trying to bring two communities together that are already burdened with too many events, SEMI will bring the relevant nanotech topics to the events they already attend. Members will see nanoelectronics become a significant part of SEMI exhibitions around the world, and SEMI will help members learn about and get the most from other nanotechnology events and shows.



"It's all about new opportunities for growth," said Tucker. "While our products—sensitive measuring equipment, especially for research and education—are already very well received in the semiconductor space, we all believe nanotechnology will be a high-growth area in the future. I want to make sure I'm seeing and taking advantage of all the opportunities I can, and SEMI is helping me do that."

Photo courtesy Keithley Instruments

THE SEMICONDUCTOR INDUSTRY AND ADVOCACY

WHEN THE CHIP INDUSTRY NEEDS TO GET WASHINGTON'S ATTENTION, SEMI IS THERE TO HELP. JOHN KISPERT LAYS OUT THE SEMI AGENDA.



Photo courtesy KLA-Tencor

WHILE MANY SEMI MEMBERS know that SEMI is active in advocacy, the achievements and the challenges around a successful advocacy effort are often unknown except to those working on the program.

This year, SEMI's efforts in United States advocacy face additional challenges. The Administration and both houses of Congress face legislation on the war in Iraq, health care, and education, and the recent change in the makeup of Congress will also affect efforts to educate and to help congressional members move forward on an agenda favorable to the semiconductor industry.

To explain these challenges, we asked John Kispert, the president and chief operating officer of KLA-Tencor,

to highlight SEMI's recent advocacy accomplishments and plans for 2007. Mr. Kispert is uniquely qualified to discuss this, as he was a member of SEMI's North America Advisory Board from 2002 to 2005 and the chairman of SEMI's Public Policy Committee in 2004 and 2005. He has also acted as a semiconductor industry spokesperson before Congress and the Administration, and has served as chairman of SEMI's Political Action Committee (PAC).

"SEMI has an active and effective U.S. government advocacy program, but SEMI hasn't told a lot of members about recent accomplishments. SEMI's biggest advocacy success was in export controls, where we were able to remove semiconductor automated test equipment (ATE) from the controlled

items list. SEMI's lobbying efforts also reduced export license processing times by about 25%, which helps ensure global equity with other suppliers. Also, SEMI's efforts helped with the issuance of 20,000 additional H-1B visas (over the annual 65,000 cap) if the applicant has an advanced degree in mathematics, science, or engineering—exactly the kind of people the semiconductor industry needs."

"There are going to be many challenges in 2007. Besides the ongoing efforts to make legislators aware of the semiconductor industry and its importance, the many policy and budget issues facing the government will cause us to have to work harder to get our messages out."

"THE MANY POLICY AND BUDGET ISSUES FACING THE GOVERNMENT WILL CAUSE US TO HAVE TO WORK HARDER TO GET OUR MESSAGES OUT." — JOHN KISPERT,

SEMI PLANS TO DEVOTE SIGNIFICANT EFFORTS TO THESE FOUR MAJOR ISSUES IN OUR LOBBYING FOR 2007:

Research and development funding and the research and development tax credit:

SEMI's goal is to double the research and development budgets for the National Science Foundation (NSF) and the National Institute of Science and Technology (NIST) over 7 years. While this proposal has broad support among legislators, especially in view of the various innovation proposals already in both houses of Congress, tight budgets and new rules on funding as instituted by the new House leadership will make this difficult.

Progress on China export controls: There are two parts to this effort. The first is to get regulations passed to allow "pre-approved" customers, also called "validated end-users." After this approval has been granted to an end-user, individual licenses would no longer be required, thus expediting shipments. For the semiconductor industry, the relatively small number of fabs in China would mean SEMI's efforts to get these fabs listed as "validated end users" would benefit all U.S.-based SEMI members. As an aside, this process would also apply to foreign semiconductor companies with U.S. subsidiaries.

The second part of SEMI's effort is to reduce or eliminate the inclusion of semiconductor processing equipment on the new list of proposed controlled items. A unilateral trading restriction would only serve to hurt U.S. interests, as many of our trading partners would not follow this lead.

Sarbanes-Oxley Reform: The cost projections for implementation of the Sarbanes-Oxley Section 404 reporting requirements have proven to be woefully low; the costs for the second and later years of implementation have, contrary to the original expectations, not dropped as expected. Smaller companies have been affected disproportionately, and we need to get the cost/benefit ratio in line with the risks. The money spent on compliance is not going into innovation, research, or development, so if we can address these needs fairly at lower cost, all SEMI members will benefit.

The Securities and Exchange Commission (SEC) has put out a proposal to reform their guidance on how to implement Sarbanes-Oxley. SEMI is pulling together a group of member executives to comment, especially in assessing risk and making any solutions easily scalable. The Public Company Accounting Oversight Board is also proposing new auditing standards, and SEMI is ensuring the industry's interests are represented during this proposal and comment phase as well.

SEMI's PAC: SEMI's Political Action Committee will be active, and will need more funding to continue to raise awareness among congressional members about the importance and the needs of the industry. Raising this industry visibility takes money, and the PAC is the best way to effectively fund such efforts.

This list is not exhaustive—other SEMI policy priorities for 2007 include legal immigration reform and intellectual property protection. It will be a challenging year for advocacy in the U.S., but SEMI's efforts provide a valuable benefit for all members and for the industry. If you're interested in more information, or if you want to participate, please contact the SEMI Washington, DC office at 202.289.0440 or semidc@semi.org.



Advocacy Efforts in China


SEMI members have identified several opportunities for advocacy efforts in China to improve the business prospects for SEMI members worldwide. At an executive round table meeting held in late 2005, the following issues were identified and plans were developed to address the concerns:

- Business Environment: Logistics
- Human Resources
- China RoHS
- Export Control
- Intellectual Property Protection
- Visas to the United States
- Domestic Equipment Manufacturing

The SEMI China staff, led by SEMI China president Mark Ding (above) has developed a comprehensive plan to improve each of these areas. By forming several local committees, SEMI is helping to define, analyze, and propose solutions for these issues. Where appropriate, SEMI and SEMI members are participating and helping to guide discussions with government and political leaders.

Specific actions that have already occurred include improvement of bonded items transferred through the Chinese customs process. The ability to get goods into and out of China easily and with minimal paperwork allows SEMI members to be more responsive to customers, improving overall profitability while reducing inventories. SEMI is of course working with the Chinese government to suggest best practices for RoHS implementation, and to get that information to SEMI members in a clear and actionable manner.

SEMI has also addressed the issue of helping employees of SEMI member firms in China get U.S. visas in order to get training and to make buying decisions. SEMI China has arranged for Chinese immigration officers to train SEMI member companies on the best approaches to getting visas for U.S. visits, reducing the long lead times and the unpredictability of the visa application process.



“SEMI is a key resource in continued expansion of our global business.”

Photo courtesy CMC Interconnect Technologies

NAME/TITLE**Nicholas Leonardi**

Vice President of Sales and Marketing

COMPANYCMC Interconnect Technologies,
Tempe, Arizona**SEGMENTS & PRODUCTS**

CMC provides technology and business consulting to the electronics industry, with expertise in electronic interconnect and advanced materials.

TYPICAL CUSTOMERS

Tier 1 semiconductor manufacturers, packaging and assembly subcontractors and advanced materials companies.

OUTLOOK FOR THE NEXT YEAR

Forecasting continued growth based upon the current projects and expansion into new clients.

YEAR BECAME A SEMI MEMBER

2006

SEMI MEMBER PROFILE

“CMC Interconnect Technologies is a global resource providing key technology and business solutions within the electronics industry. Founded in 2004, CMC has continued to expand its role in the electronic interconnect and advanced materials industry from a regional and national presence to a company supporting a wide global client base. With this growth came the need to align with an organization that could be an immediate worldwide resource to CMC. A strong global presence is a very high priority for CMC as the momentum continues for our projects in Asia and China. With our existing and new client relationships in state-of-the-art technologies, SEMI has become a resource for information on several of our projects.”

“*CMC’s consulting clients* come from a range of electronic industry segments, including semiconductor, telecommunication, opto-electronic, medical, high brightness LED, military, aerospace and consumer products. With companies from

each of these segments already members of SEMI, membership gives CMC an additional connection to customers on a global basis. CMC’s projects range from technical support and process development addressing new electronic interconnect problems to marketing plans and business strategy development. SEMI participation gives CMC access to a full spectrum of decision makers at SEMI member companies.”

“*The CMC technical staff* has decades of experience and expertise in advanced materials and electronic interconnect process technologies. Projects cover the scope of device, package, board and systems level technical analysis and consulting, to research reports and business market studies. SEMI membership allows us to connect to clients and prospective clients across this wide range of services and industries.”

“*Following membership in early 2006*, the CMC management team became

directly involved with participation at SEMICON® West 2006. CMC was a speaker in the forum presentation on Material Technology in Electronic Packaging and chaired the forum session on Packaging and Assembly Roadmaps. CMC management anticipates participation in the other global SEMICON events, such as SEMI events in Taiwan and China.”

“*CMC management will continue* to leverage both the technical and business resources that SEMI has to offer as an additional tool to grow our business. CMC is particularly excited about SEMI’s worldwide presence and ability to become a valuable ally as CMC expands services in Asia and China.”

Please visit the CMC Website:

www.cmcinterconnect.com

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SEMI SCHEDULE

April 11–14, 2007	Global FPD Partners Conference 2007	Nagasaki, Japan	www.semi.org/gfpc
April 16–17, 2007	SEMI Executive Conference in Israel	Tel-Aviv, Israel	www.semi.org
April 23–25, 2007	Strategic Business Conference (SBC) 2007	Napa Valley, California	www.semi.org/sbc
May 8–10, 2007	SEMICON Singapore 2007	Singapore	www.semi.org/semiconsingapore
June 11–12, 2007	ASMC 2007	Stresa, Italy	www.semi.org/asmc
June 18–19, 2007	SEMI Forum Japan 2007	Osaka, Japan	www.semi.org/sfj
July 4–6, 2007	FPD Expo Taiwan 2007	Taipei, Taiwan	www.semi.org/semicontaiwan
July 16–20, 2007	SEMICON West 2007	San Francisco, California	www.semi.org/semiconwest

COUNTERING THE COUNTERFEITS

SEMI EMBARKS ON A GLOBAL IP SUPPORT PROGRAM

Intellectual property (IP) has been a major concern for SEMI members in the microelectronics and related industries. With increasing levels of globalization and the rapid evolution of next generation technologies, the problem has become a significant threat to industry growth and profitability. To address these concerns, SEMI has undertaken a number of programs to enhance IP value and strengthen IP rights for members around the world.

In a 2006 survey conducted by SEMI, 47% of respondents surveyed ranked IP issues as "extremely serious business challenges," and an additional 35% ranked them as "somewhat serious." Almost three-fourths stated that IP issues have already had an adverse commercial impact on their company. In estimating the costs of IP piracy, several respondents estimated large losses from a decline in market share or damage to brand by low quality copies of parts or systems.

In the survey, patent infringement of core products and technology was rated as the most common type of IP violation followed by the counterfeiting of spare parts, components and core products. Trade secret theft and human

resource problems were also mentioned by several respondents.

A Broad-Based Approach

To meet the industry's IP challenges, SEMI has created a number of programs and services to comprehensively address the issue. Last year, there were a number of important steps taken, including establishing IP Working Groups, the publication of an IP Best Practices paper, and the initiation of an IP information area on the semi.org website. In 2007, SEMI is planning an IP White Paper for fall publication that seeks to quantify the economic impact of IP violations, provide a fact-based summary of the issues, raise awareness of the problem, and recommend remedies.

Other programs scheduled include

the development and execution of a two-day Global IP Management course for delivery in the U.S., followed soon by international rollout to other manufacturing regions of the world. Elements of the course include a one-day IP Asset Management module, followed by modules on Asserting IP Rights and International Developments for the second day.

In 2007, SEMI will also host an IP Webinar that will raise awareness, highlighting global issues and further action items. Other activities include active outreach with regional government officials to discuss our industry's challenges and the next steps needed. SEMI will also engage with groups such as other semiconductor industry associations and regional organizations such as the U.S. Coalition Against Counterfeiting and Piracy to discuss joint activities.

Intellectual property rights and protections will remain challenging issues for the future. But, through the collaborative and coordinated efforts of SEMI members and other organizations, the industry can minimize negative impacts and maximize a healthy, supportive environment for the creation of valuable intellectual property.

SEMI EHS EFFORTS ENABLE MEMBER SUCCESS

Photo courtesy Rhotech, Inc.



"The SEMI EHS Division's efforts to build a members' working group on China RoHS is helping the industry get in front of China's upcoming regulatory changes. In particular, the meeting that SEMI organized with the Chinese Ministry of Information Industry helped me to shape Rhotech's response to the China RoHS deadline of March 1, 2007. What I learned during that meeting has led to plans that are more pragmatic and cost effective than what we might otherwise have pursued."

Vince McGinty, president, Rhotech, Inc., Coopersburg, Pennsylvania

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passion



PERSEVERANCE

SUPIKA MASHIRO GIVES TO SEMI STANDARDS...AND RECEIVES

It has been said that Supika Mashiro brings “passion and perseverance” to the International Standards program. It is precisely these qualities that have served her well in the 10 years she has been participating in the SEMI International Standards program, and a key factor in her selection for last year’s Karel Urbanek Award in honor of her many contributions to the program.

Supika Mashiro of Canon ANELVA has been in the semiconductor industry since she graduated from Yamagata University in 1983 with a Bachelor’s Degree in applied chemistry. After many years working on dry etching process development and other programs, she began her involvement in SEMI Standards after she received a “call for members” announcement from the SEMI Japan Standards Division regarding safe handling of silane and related gases.

“Receiving management’s support was essential for me to participate in meetings, and to make a commitment with other Standards volunteers,” said Supika. “Industry standards activities are so important. In order for the industry to continue to make sound growth, effective collaboration and resource distribution is essential. Participation of the people in industry standards promotes up-to-date and practical standardization, which enables more cost-effective development of technology and products.”

Since she became involved in SEMI Standards, her primary focus has been

on the development of “truly international” safety guidelines that are acceptable and useful to the semiconductor and related industries around the world.

Her drive and determination have been vital to the important progress that EHS activities have achieved in recent years. As a member of the EHS global coordination subcommittee, she supports the newly formed Taiwan EHS committee through joint meetings and participation in Standards related programs. Since 2004, she has been involved in various standardization process improvement activities, including as the Standardization Process Integration (SPI) Task Force leader delegated to respond to revision proposals on the SEMI Standards Regulations and Procedure Guide by the Japan Regional Standard Committee (RSC) co-chairs. It was in this capacity as RSC delegate that she proposed uniform tools for procedural review by the Audits and Reviews subcommittee.

One additional benefit of Supika’s involvement in SEMI Standards is the

broader perspective and insight she gets into the problems and challenges facing the industry. “Involvement in SEMI Standards enabled me to better perceive device manufacturers’ interests and concerns, especially in the area of factory automation. This perspective has been very valuable when I was involved in development of our new UHVCVD system. Useful industry information is often obtained only through active standards involvement.”

But participating in industry standards activity has personal rewards as well as business benefits. “I enjoy many friendships with people from different part of the globe with different technical and cultural backgrounds.”

And as winner of The Karel Urbanek Memorial Award, the highest Standards honor bestowed by SEMI, participating in industry standards has also brought Supika worldwide recognition in the industry. When asked how he she felt when learning about the award, in her quiet way she replied, “I felt old, but also deeply honored.”



“Receiving management’s support was essential for me to participate in meetings, and to make a commitment with other Standards volunteers.”