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Inside

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Financial Justification for Cycle Time Improvement Efforts

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Have you ever wondered:

- How do I cost-justify cycle time improvement efforts?
- What is the impact on the bottom line from cycle time improvement?
- What difference does having better cycle times make? Shouldn't we just focus on throughput?

These are the kinds of questions that newsletter subscribers and prospective customers ask FabTime on a regular basis. We've addressed dollar benefits from cycle time improvement in two previous FabTime newsletter issues (Issue 2.6 and Issue 3.5), but thought that we could all benefit from a fresh, nuts-and-bolts look at the question, with numerical examples.

This topic follows naturally on the heels of last month's article (Issue 7.06) about a fundamental conflict in wafer fabs: the pressure to simultaneously increase tool utilization and decrease cycle time. As we discussed, fabs are under cost pressure to increase utilization, so that they can get more throughput from the same toolset. At the same time, there is pressure to reduce cycle times, to please customers and introduce new products quickly. [Continued on Page 3]

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Calendar of Events

December 2006

3-6 **Winter Simulation Conference**
Monterey Conference Center
Monterey, CA

5 **Understanding and Using COO**
Makuhari Messe
Chiba, Japan

6-8 **SEMICON Japan**
Makuhari Messe
Chiba, Japan

January 2007

7-10 **Industry Strategy Symposium (ISS)**
The Ritz-Carlton
Half Moon Bay, CA

February 2007

4-6 **Industry Strategy Symposium (ISS)**
Kongresshaus
Zurich, Switzerland

March 2007

4-8 **SEMI North American Standards**
Boston Marriott Quincy
Boston, MA

21-23 **SEMICON China**
New International Exhibition Centre
Shanghai, China

April 2007

23-25 **Strategic Business Conference**
Meritage Resort
Napa, CA

These two pressures are at odds with one another, because cycle time tends to increase with increasing equipment utilization. What makes this conflict particularly difficult to balance is the fact that there is no one straightforward equation for quantifying the dollar value of cycle time reduction. So, on the one hand, we have a clear financial benefit that is tied to utilization increases. On the other hand, the financial benefit from cycle time reduction is much murkier. However, there are some relationships that we can quantify, as discussed below.

Increasing Throughput through Improved Management of Cycle Time

As we have discussed previously in this newsletter, every fab has an operating curve, which is the graph of cycle time x-factor (cycle time divided by theoretical process time) vs. fab utilization percentage. The operating curve generally looks like a hockey stick. It starts out low and flat, at low utilization values, and then increases rapidly and non-linearly at higher utilizations. When the fab utilization (generally defined as the utilization of the bottleneck), approaches 100%, the cycle time gets very large. This is because the bottleneck doesn't have any catch-up capacity, and once a queue starts to build up, there's no way to ever work that queue off. To avoid this, most fabs plan their capacity such that the bottleneck tool group (the tool group with the highest utilization) is loaded to no more than 85% or 90% of the maximum amount that could be run on the tools. The remaining 10%-15% is called spare capacity, catch-up capacity, slack capacity, and other names. But the idea is to provide a buffer to keep cycle times from getting out of hand. Other tool groups in the fab have the same buffer, or one that is even larger. This allows a fab to avoid the steepest part of the operating curve.

As we have also discussed, the exact shape of a fab's operating curve is heavily dependent on the amount of variability in the fab. That is, the more sources of variability a fab demonstrates, the higher the cycle time will be at a given utilization, and the higher the curve will appear. Here we're talking about variability in how lots arrive to tools (do they arrive at evenly spaced intervals, or in burst?), and in how lots are processed at tools (is the rate at which lots leave a tool consistent, or do we sometimes have downtime and setups and operator delays that make things more variable?). If we can do things in the fab to better manage cycle times, by reducing the amount of variability, we can actually move the fab onto a different, more favorable, operating curve. This gives us two choices:

1. Reduce cycle time, while maintaining the same throughput rate (by moving straight down from the old operating curve to the new, lower one).
2. Increase the throughput rate, while maintaining the same cycle time (by moving across horizontally to the new operating curve).

Let's look at that second option again. By reducing variability in the fab (by better managing operation cycle times) we can choose to increase throughput slightly, and still get the same overall fab cycle time. If we manage variability well, we can reduce the size of the capacity planning buffer described above. This means that we can get more throughput out of the same toolset. The financial benefit from increased throughput in an existing toolset is straightforward to quantify.

*Current Annual Profit * Percent Increase in Fab Throughput = Annual Profit Increase*

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The above formula assumes that your fab will be able to sell the additional wafers produced at approximately the same profit margin.

Throughput Increase Example:
Here is a simple example, which you can adjust to make relevant for your own fab:

Assume a capital equipment base of $100 million and five-year straight-line depreciation. (Substitute here for whatever is relevant for your fab).

In the above case, the fab must generate at least $20 million annually in profit simply to cover depreciation. (Again, the idea is to use a ballpark estimate of annual profits, regardless of whether you look at the depreciation or some other index to get the number).

If a cycle time improvement project allows you to squeeze your capacity buffer, and increase your wafer ships by 1% (with the same equipment), and your fab sells them at the same profit margin, then your profit increases by $20M * 0.01 = $200,000/year = $16,667/month.

Financial Benefits from Cycle Time Reduction Efforts
Instead of using variability reduction to drive throughput increases, you can also, of course, choose to reduce cycle time in your fab. The financial benefits that you may observe from this change include:

1. Improved Line Yield
2. Reduced Cost of Carrying Work in Process (WIP)
3. Reduced Cost of Engineering Change Notices
4. Reduced Risk of Writing Off Obsolete Inventory
5. Increased Revenue Due to Pricing Premiums from Getting Products to Market More Quickly

We will discuss the first two of these in detail, as these are the easiest to agree upon and quantify for many fabs, and will briefly discuss the other three. You can find most of the methods discussed here included in FabTime's Bottom Line Benefits Calculator, a free Excel tool available for download from:

http://www.fabtime.com/bottomline.shtml.

See especially the formulas outlined on the Details page.

1. Improved Line Yield
It is generally accepted that the longer a lot is in the fab, the higher the probability that the lot will encounter some sort of yield problem. While there are no hard and fast numbers here, you can make an assumption that seems reasonable for your fab. For example, a 10% cycle time reduction might correspond to a 0.5% increase in line yield. Improving line yield means that you can either start fewer wafers to obtain the same number of outs, or produce some additional good wafers out.

Starting fewer wafers results in a straightforward savings in raw material cost. Also, if you start fewer wafers, you get a small decrease in bottleneck utilization, which in turn will tend to lead to further cycle time improvements. These cycle time improvements may lead to further yield improvements, and your fab will experience a positive improvement cycle. Looking only at the savings from decreased raw material requirements, we have:

*Cost Reduction Due to Yield Improvement = (Previous Number of Wafer Starts per Year - Revised Number of Wafer Starts per Year) * Raw Wafer Cost.*

Example:
Suppose that you currently start 1000 wafers per week, and have a 95% line yield. This means that your throughput rate is 950 good wafers out per week. If you improve line yield by 0.5%, to 95.5%, then you only need to start 950/0.955 = 994.8 wafers/week. This means that there are five wafers per week that your fab will not need to start. This multiplies out to 5*50 = 250 wafers per year. At a raw wafer cost of $40/wafer, this is a savings of $10,000.

Alternatively, if cycle time improvement leads to a yield improvement, your fab may elect to simply get more wafers out, for the same start rate. The additional cost for getting these wafers out is very small (mostly extra consumables). So, you can estimate the increased revenue as:

*Revenue Due to Yield Improvement = (Previous Number of Wafer Outs per Year - Revised Number of Wafer Outs per Year) * Selling Price/Wafer*

Example:
Using the above example, if the fab initially gets 950 wafers out per week, and yield is improved to 95.5%, then the fab will start to get out 955 wafers per week, or 5 additional wafers per week. This multiplies out to 250 wafers per year. If your selling price is $1000/wafer, this is a revenue boost of $250,000/year.

Note that your fab has a choice of one yield improvement benefit or the other here. You can either start fewer wafers, to get the same throughput, or you can get more wafers out, at the same start rate. If you choose the latter, there may be a slight negative impact on cycle time. This is because for the operations later in the line, the extra wafers that have not been scrapped will cause a slight utilization increase. This may result in some circular behavior by which cycle time goes down, fewer wafers are scrapped, utilization increases on back-end tools, and then cycle time increases slightly. However, it is unlikely that cycle time will increase to your previous level, and you will in any event have the revenue from the extra outs to make up for this inconvenience.

2. Reducing WIP Carrying Cost
Another dollar benefit from reducing cycle time comes from reducing the cost of carrying the WIP in your fab. Because your fab has inventory sitting on the floor in the form of partially processed wafers, your company is not able to use the value of that WIP for other investments. If you reduce the WIP in the fab, you reduce the associated carrying cost of the WIP, and you free up some money for other things. This is a one-time benefit, but can be substantial.

WIP Carrying Cost Reduction = Original WIP Carrying Cost - Revised WIP Carrying Cost

Where

*WIP Carrying Cost = Average WIP * Mid-Line Value per Wafer * Company's Internal Cost of Capital*

and we know from Little's Law that

*Average WIP = Start Rate * Cycle Time * Yield Correction*

where the standard yield correction is:

Yield Correction = (1 + Line Yield) / 2 (This assumes that scrap occurs linearly across the line)

Example:
Suppose, using some of the numbers from above, that a fab starts 1000 wafers per week, has a cycle time of 5 weeks, and has a line yield of 95%. Little's Law tells us that the average WIP in this fab will be 1000 wafers/week * 5 weeks * (1+0.95)/2 = 4875 wafers. We said earlier that the raw wafer cost was $40, and that the per wafer selling price was $1000. This means that the average value of each wafer in WIP (assuming that value accrues linearly throughout the line) is (1000+40)/2 = $520/wafer. This means that the average value of the WIP in the fab is 4875 wafers * $520/wafer = $2,535,000. If the fab's internal rate of return for investments is 15%, then the cost of carrying this WIP, at any point in time, is $380,250.

If this fab makes improvements to reduce the cycle time by 20%, from 5 weeks to 4 weeks, then the WIP in the fab decreases by the same 20%, and we have a revised average WIP of 3900 wafers (neglecting any possible changes to the yield rate). The average value of this WIP is 3900*$520 = $2,028,000, and the cost to the fab of carrying the WIP is $304,200.

If this fab can reduce cycle time by 20%, then the cost of carrying the WIP will decrease from $380,250 to $304,200, a one-time difference of $76,050.

3. Reduced Cost of Engineering Change Notices

The idea here, as with the line yield discussion, is that the longer your WIP is in the fab, the greater the risk of it being subject to an engineering change notice (ECN). Usually some percentage of WIP is subject to ECNs. Therefore, if you have the numbers available, you can compare the current cost of ECNs for your fab to a likely ECN cost if the average WIP decreases by some percentage.

4. Reduced Risk of Writing Off Obsolete Inventory

Most fabs make at least some of their WIP to stock, providing a safety stock amount as a buffer against uncertainty in planning. The problem with this is that the more WIP you have in your safety stock, the greater the probability that the industry will take a downturn, and you will have to write off some of that WIP. There are formulas for estimating the required safety stock, given a fab's cycle time. By reducing cycle time, your fab can afford to hold less safety stock, decreasing your risk of writing off WIP. You can find more details in Issue 3.5 (email newsletter@fabtime.com for a copy).

5. Increased Revenue Due to Pricing Premiums from Getting Products to Market More Quickly

Increased sales revenue is potentially the highest lever, in terms of justifying the cost of cycle time improvement efforts. However, it is also the lever that is hardest to quantify, and get people to agree to, because it requires assumptions about what customers will pay in the future. However, as a very simple example, suppose that by reducing cycle time by 20%, your company can get a key new product to market more quickly, and can charge a 30% price premium (for some limited time). You can easily do the math to estimate what that might be worth for your company.

In the semiconductor industry, selling prices drop rapidly over time, with the peak price being charged when a product first comes to market. This is particularly pronounced in the memory chip market. There is a published paper by Robert Leachman (reference below) about a cycle time improvement project that: "reduced manufacturing cycle times to fabricate dynamic random access memory devices from more than 80 days to less than 30. Considering the decline of selling prices for dynamic random access memory devices, (the project) enabled Samsung to capture an additional $1 billion in sales revenue compared to the revenue it would have realized had cycle times not been reduced." Several potential methods of quantifying the increased revenue from cycle time reduction are outlined in Issue 3.5 (email newsletter@fabtime.com for a copy).

Conclusions

The financial benefits from cycle time improvement are not as easy to estimate as the dollar benefits from utilization improvement. However, there are several clear and quantifiable benefits that stem from variability reduction and cycle time improvement. If we can reduce variability in the fab, we have the option of squeezing the existing capacity buffer, and getting some extra throughput out of the same toolset. This has a clear financial benefit, as outlined above. Alternatively, if we reduce variability in the fab, we can reduce cycle time. Cycle time reduction is tied to several other benefits: improved line yield, decreased WIP carrying cost, decreased cost of engineering change notices, decreased risk of obsolete inventory, and increased revenue from time to market pricing premiums. In this article, we have reviewed the first two of these benefits in detail, with numerical examples, and included highlights of the other three. We hope that you find this article useful in justifying and motivating your cycle time improvement projects.

Acknowledgement

We would like to thank Ken Beller and Stuart Carr for past discussions on these topics, which have contributed to our understanding in this area. Special thanks to Ken also for suggesting that we write this current article.

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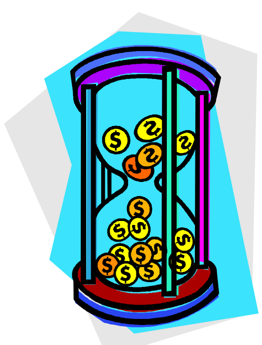
- See also Wright Williams & Kelly's Cost of Ownership Bibliography (http://www.wwk.com/resources.html).



Brooks Automation Announces Sale of Brooks Software Division to Applied Materials

“CHELMSFORD, Mass., Nov. 6 /PRNewswire-FirstCall/ -- Brooks Automation, Inc. ("Brooks") (Nasdaq: BRKS) today announced the signing of a definitive agreement under which Brooks will divest and sell its software division, Brooks Software, to Applied Materials, Inc. (Nasdaq: AMAT).”

Once again it appears that the former AutoSimulations (ASI) software products are on the move. Over the past few years those tools have gone from being privately held, to being sold to Daifuku, then to Brooks, and now are headed to Applied Materials. The fate of these tools (AutoSched, AutoMod, etc.) will have to wait to be seen as product support and development plans have not been released.

In a move similar to the 1999 case when Manugistics bought and then ultimately shuttered simulation pioneer Tyecin Systems and the ManSim and TestSim product lines, WWK is offering discounted consulting services and software licenses to any AutoSched clients that would like to move to the Factory Explorer® platform.

For a written comparison of AutoSched AP and Factory Explorer® or more information on this special “switch” offer, contact WWK at info@wwk.com. Indicate in the subject line your interest in this document or other information.

Cost of Ownership Impacts on LPCVD Poly Silicon Deposition

Summary of Detailed Results

David W. Jimenez
Wright Williams & Kelly, Inc.

Background

For more than 20 years the semiconductor industry has sought a solution to the acute problems that accompany the use of quartz and silicon carbide (SiC) in furnace processes. These processes, including high temperature anneal, diffusion, and deposition processing, make up to 30% of the major process steps in wafer manufacturing.

While recent improvements in furnace cleaning have helped to remediate particle defects induced by quartz or SiC consumables, engineers still have not achieved the overall reduction of defect rates required for state-of-the-art manufacturing environments. Moreover, the cleaning process is costly; capital, chemicals and the necessary environmental safeguards drive up the cost of ownership (COO).

Additionally, integrated circuit (IC) manufacturers must cope with trace metal contamination, “slip” due to differences in the Coefficient of Thermal Expansion (CTE) between wafer support consumables and the wafer, and consumables’ structural stability in the high-temperature processes.

Now, given the demanding characteristics of advanced IC device processing as the industry continues to both shrink device architectures and move to 300-mm wafers, the need for a solution to these problems grows even greater.

To address these problems, Integrated Materials recently introduced its patented SiFusion™ technology that allows for the manufacture of pure poly silicon furnaceware. SiFusion is the first proven application of poly silicon furnaceware as an alternative to current quartz and SiC consumables. The suite of SiFusion products includes furnace boats, liners, injectors and pedestals. These products are designed for furnaces from the major capital equipment suppliers; Tokyo Electron, Hitachi-Kokusai, ASM, Aviza, and others.

With the introduction of SiFusion as a viable alternative to traditional consumables, there is an opportunity to examine the COO for all three furnace consumable materials. Thus, Integrated Materials retained a COO modeling expert, Wright Williams & Kelly, Inc. (WWK), to examine pure poly silicon furnaceware compared to quartz and SiC in both 200-mm and the 300-mm environments.

Cost of Ownership Overview and Methodology

WWK created an extensive matrix to examine materials combinations for both 200-mm and 300-mm low pressure chemical vapor deposition (LPCVD) poly silicon applications. The materials examined were quartz, SiC, and pure poly silicon (SiFusion). These materials were examined for both boat and liner applications as well as quartz versus poly silicon injectors. The fundamental parameters for the vertical furnace remained constant regardless of materials used but were updated for differences in wafer size. The objective of this project was to estimate the operational cost differences resulting from these material combinations.

For the following analyses, WWK utilized TWO COOL®, the semiconductor industry's COO and overall equipment efficiency (OEE) standard. TWO COOL is the only software to comply with Semiconductor Equipment and Materials International (SEMI) Standards E10, E35, and E79.

200-mm COO Cost Drivers

Examination of the detailed TWO COOL COO models for each material combination highlights the main cost driver differences. In the case of quartz boats and liners, the main cost drivers, aside from the equipment factors that are the same for all analyses, are the increased frequency of cleaning and the resultant decreases in equipment utilization and high cleaning costs, and the short useful life. Some of these higher costs are offset by the relatively low price for these parts.

SiC components provided an interesting analysis in that the combination of an SiC boat and a quartz liner had a lower COO than the SiC/SiC combination. This is based on the fact that SiC liners require the same amount of cleaning compared to quartz, cost significantly more to purchase, but last significantly longer. SiC boats have half the cleaning frequency of quartz. The significantly higher purchase price for SiC is mitigated somewhat by their long potential life. However, the cleaning frequencies place these high-price materials at risk of breakage on a regular basis and, thus, lead to near cost parity between SiC and quartz materials.

SiFusion boats and liners provided the lowest COO by a substantial margin. This was achieved through the near elimination of routine cleanings for both components. This increased the Production Utilization Capability by 3.3% and reduced lifetime costs by almost $300k. The higher purchase price of the SiFusion material is more than offset by its long life and drastically reduced risk of breakage.

Based on these results, it is estimated that the payback period for the SiFusion boat is 25 weeks ([$22,000 - $2,500]/[[$4.09 - $3.80] x 2,651 wafers out per week]) compared to quartz and half that compared to SiC. Further, the SiFusion liner has a payback period compared to quartz of 65 weeks and 33 weeks for SiC.

Quartz versus SiFusion Injectors

The data presented so far has been with quartz injectors, which represents over 60% of the total materials costs in the SiFusion/SiFusion example. It is estimated from client data that quartz injectors have an average deposition life of 2 µm. This is due to warpage, breakage, and particle formation. With the introduction of SiFusion injectors, we can examine an alternative to this significant cost component. In the case of SiFusion injectors, it is estimated that injector life would be in excess of 1,200 µm. However, we have taken a more conservative approach in our analysis and assumed that SiFusion injectors would be changed at the six-month preventive maintenance (PM) of the outer tube.

Based on these conservative results, it is estimated that the payback period for the SiFusion injectors is less than 9 weeks ([$10,000 - $600]/[[$3.63-$3.22] x 2,772 wafers out per week]) compared to quartz. The lifetime cost savings for injectors alone is nearly $300,000.

300-mm COO Cost Drivers

Examination of the detailed TWO COOL COO models for each material combination highlights the main cost driver differences. In the case of quartz boats and liners, the main cost drivers, aside from the equipment factors that are the same for all analyses, are the increased frequency of cleaning and the resultant decreases in equipment utilization and high cleaning costs, and the short useful life. Some of these higher costs are offset by the relatively low price for these parts.

In the 300-mm case, the SiC liner had a lower COO than the quartz liner, resulting in an SiC/SiC combination with the lowest COO ignoring all the SiFusion combinations. This is based on the fact that SiC liners require the same amount of cleaning compared to quartz, but last significantly longer, overcoming the purchase price deltas. SiC boats have half the cleaning frequency of quartz. The significantly higher purchase price for SiC is mitigated somewhat by their long potential life. However, the cleaning frequencies place these high-price materials at risk of breakage on a regular basis and, thus, lead to near cost parity between SiC and quartz materials. The difference between the lowest COO result for SiC and the highest COO for a quartz combination was only $0.04.

SiFusion boats and liners provided the lowest COO by a substantial margin. This was achieved through the near elimination of routine cleanings for both components. This increased the Production Utilization Capability by 3.3% and reduced lifetime costs by almost $600k. The higher purchase price of the SiFusion material is more than offset by its long life and drastically reduced risk of breakage.

Based on these results, it is estimated that the payback period for the SiFusion boat is 45 weeks ([$48,000 - $5,000]/[[$5.77 - $5.34] x 2,209 wafers out per week]) compared to quartz and under 11 weeks compared to SiC. Further, the SiFusion liner has a payback period compared to quartz of 46 weeks and 23 for SiC.

Quartz versus SiFusion Injectors

The data presented so far has been with quartz injectors, which represents over 25% of the total materials costs in the SiFusion/SiFusion example. It is estimated from client data that quartz injectors have an average deposition life of 2 µm. This is due to warpage, breakage, and particle formation. With the introduction of SiFusion injectors, we can examine an alternative to this significant cost component. In the case of SiFusion injectors, it is estimated that injector life would be in excess of 1,200 µm. However, we have taken a more conservative approach in our analysis and assumed that SiFusion injectors would be changed at the six-month PM of the outer tube.

Based on these conservative results, it is estimated that the payback period for the SiFusion injectors is less than 8 weeks ([$10,000 - $600]/[[$4.83-$4.27] x 2,310 wafers out per week]) compared to quartz. The lifetime cost savings for injectors alone is over $250,000.

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Conclusions

Integrated Materials proposes these advantages for IC manufacturers when using SiFusion-produced pure poly silicon furnaceware, as compared to quartz or silicon carbide consumables:

1. No other material used in semiconductor processes can compare to the purity of Integrated Materials' poly silicon fixtures. Integrated Materials components are clean to <1.0 E10 / cm2 for all trace metals.
2. In LPCVD processes, the close match of Coefficients of Thermal Expansion (CTE) between Integrated Materials' component and the LPCVD film and Integrated Materials' patented surface preparation result in the elimination of fixture-generated particles.

Long-term production use of Integrated Materials' pure poly silicon boats in LPCVD poly silicon furnaces confirms that almost no scheduled cleaning is needed. Benefits from the near elimination of cleaning include:

1. Significant cost savings by the significant reduction of HF and other chemicals used for cleaning.
2. Environmental benefits from the minimization of toxic chemical disposal.
3. Fewer process interventions resulting in more stable furnace operation.

At temperatures to 1375°C, Integrated Materials' pure poly silicon boats do not deform. Integrated Materials' poly silicon products are thermal shock resistant: they maintain their mechanical tolerances at temperatures far above those experienced by IC wafers. SiFusion fixtures exposed to 1350°C in excess of 12 months have maintained tolerances and exhibited no structural degeneration from their original form.

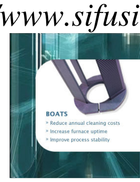
The CTE for the wafer and Integrated Materials' poly silicon boat match, allowing for increased thermal ramp rates and reduced thermal stabilization times while eliminating damage to the wafer and eliminating boat-inducted slip. Integrated Materials' poly silicon boats are transparent to infrared (IR) which reduces thermal "shadowing" and causes more uniform heating within the hot-zone.

Integrated Materials' precision manufacturing tolerances provide for a more efficient robotic interface that speeds up wafer load/unload time. Integrated Materials' precision standards provide for true "plug-and-play" use.

Integrated Materials' pure poly silicon components deliver equal or longer useful life and lower COO than those made from SiC.

To download a full copy of this extensive 14-page research report, please visit the SiFusion web site at:

http://www.sifusion.com



Wright Williams & Kelly Names UNI3 System Sales Agent

Strategic Restructuring in Japan Strengthens Sales and Service

November 16, 2006 (Pleasanton, CA) –Wright Williams & Kelly, Inc. (WWK), a cost & productivity management software and consulting services company, announced today a strategic transition of its sales and support in Japan to UNI3 System Co., Ltd. This transition represents the continuation of WWK's strategic vision to provide increased sales and service support in close proximity to all of its customers, world-wide.

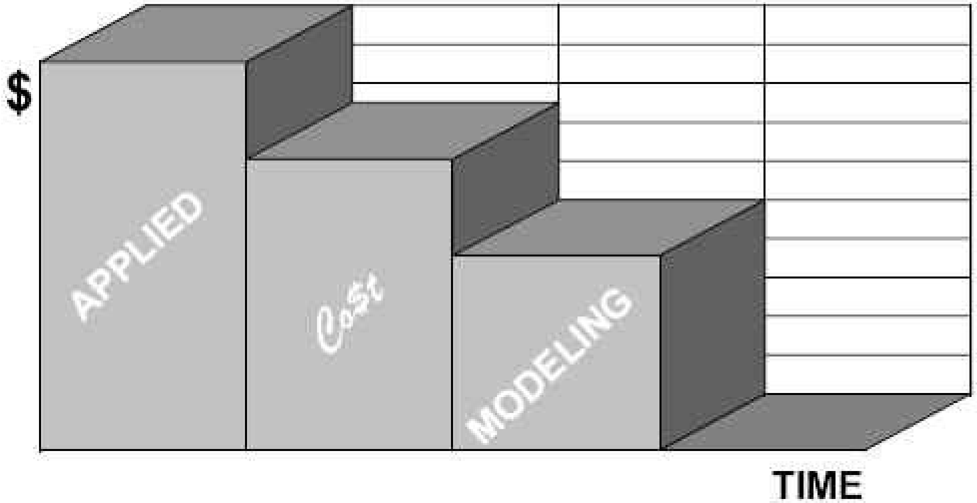
"Selastar Corporation has been representing WWK in Japan for the past several years," states David W. Jimenez, WWK's President. "They combine a comprehensive understanding of the region's high-tech climate with an extensive background in sales and support. As part of their strategic planning process, they have decided that their core competency is more aligned with hardware sales and support. For this reason, they have created a partnership with UNI3 System Co., Ltd., a dedicated software only sales and support organization, to further support WWK's software products and consulting services in Japan."

"We have been honored to represent the products and services of WWK," says Archie Ishikawa, President of Selastar Corporation. "We see a large demand for their software tools and consulting services designed to help optimize manufacturing costs and productivity. This transition will provide the best growth prospects for all our companies."

"We are very excited to add the products and services of WWK to our offerings," says Seiichi Nakazawa, President of UNI3 System Co., Ltd. "We are committed to making this transition as transparent as possible to our clients. As part of that commitment, Selastar's support staff for WWK has joined UNI3 System Co., Ltd."

UNI3 System Co., Ltd. is a privately held company offering advanced technology software products and services to the semiconductor, flat panel display, and other manufacturing industries. Established in March 2006, UNI3 System's management and engineering teams have extensive experience in the semiconductor industry, maintaining relationships with major equipment suppliers and semiconductor manufacturers. The company is able to provide solutions leveraging its market knowledge and technical know-how to best fit the customer's requirements and needs.

Selastar Corporation is a privately held company specializing in serving the Japanese semiconductor, LCD, and other microelectronics-related markets. The company's product line includes instrumentation and components which are technologically innovative and capable of significantly enhancing the level of productivity in factory operations. The company's seasoned management team, consisting of staff who were formerly with TEL and Innotech, maintains a wide range of customer contacts and brings years of experience in distribution of such products in Japan.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