



electronics update

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TSMC gives Air Products its "best supplier award"

Air Products San Fu received "The Best Supplier Award" from TSMC (Taiwan Semiconductor Manufacturing Corporation), the world's largest semiconductor foundry. The award recognizes outstanding product quality and exceptional support that Air Products San Fu has provided to TSMC over the last 12 months.

The award was presented at the "2005 Supply Chain Management Forum" held by TSMC at the Sin Chu Ambassador Hotel on September 15, 2005. It was attended by more than 350 representatives of the world's leading suppliers of materials to TSMC and other semiconductor manufacturers.

TSMC presented awards in three categories during the forum: Services, Equipment, and Materials.

Air Products San Fu Won the award for gases in the materials category. Air Products had won the best supplier award in 2002 and 2003.

James Lee, Air Products focus account manager for TSMC, said this was a great comeback for the Asia Electronics team. "We have made every endeavor to improve our supply reliability and quality to TSMC. An important part of that was our decision to restart our Taichung, Taiwan air separation plant when forecasts pointed to a shortage of liquid product among competitors. We were able to supply our contracted customers' demands and provide extra support to TSMC to help them maintain stable production in the Shin Chu Science Park."

Besides the on-site operations, the TSMC award recognizes Air Products for supply

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company doubles Allentown-based electronics R&D site

Air Products has more than doubled its Allentown, Pa.-based electronics R&D facility, making it the most advanced and comprehensive center of any specialty materials supplier to the electronics industry.

With this development, Air Products has fully integrated the research and technology capabilities it acquired when the company purchased Ashland's Electronic Chemicals business in 2003. The acquisition included an expansive portfolio of wet chemical technologies and products integral to the chip-making process, formerly developed at Ashland's Dublin, Ohio and Easton, Pa. locations.

"Now more than ever before, Air Products is better positioned than anyone to work directly with our customers and the industry's equipment manufacturers to develop solutions for the upcoming technology nodes," explained Jerry Ermentrout, general manager and vice president of the Electronics Division.

"This is an incredible accomplishment—one that showcases our materials integration and customer understanding capabilities. That's really what being the premier materials supplier is all about."

With the exception of lithography, every step of the chip-making process can be analyzed and studied at the Allentown campus. This integrated approach enables



Inspecting the etching reactor in Air Products' Semiconductor Processing Applications Research Laboratory at Allentown. As a result of facility and equipment upgrades, a commercial-scale cluster tool, capable of processing eight-inch wafers, is now being employed to support a variety of research and customer support projects.

Air Products to identify the issues facing its customers, allowing it to develop a full range of new material and technology solutions.

The center now includes almost 3,500 sq. ft. of Class 10 and Class 100 clean room space, enabling 90 Air Products scientists and technicians to work in an environment that has the broadest range of equipment and applications capabilities than any other materials supplier. The seven-month expansion project also included the addition of new office and research rooms, as well as upgrades to two existing labs.

In total, Air Products has nearly 200 individuals worldwide dedicated to developing new products,

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TSMC Vice President of Operations M.C. Tseng presents the company's Best Supplier Award to Air Products San Fu President Allen Chien, left.



Shanghai warehouse wins GSMC award

The China ESM Warehouse Operations team.



The China Electronics Customer Service team.

The Grace Semiconductor Manufacturing Corporation (GSMC), Shanghai, recognized the outstanding support services of the Air Products' Shanghai Electronics Specialty Materials (ESM) warehouse operations team and customer Service team with their "Excellence of Service" awards, which were presented in June. They reflect performance during the first half of 2005.

Morgan Zhang, ESM warehouse operations manager, said: "Our team works very closely with the Customer Services team and this award clearly demonstrates the value we bring to GSMC as 'one team.' It takes lot of hard work and attention-to-detail on the part of all our team members to provide a consistent quality—and it makes us all proud of our efforts."

GSMC is a leading semiconductor manufacturer (foundry) in China and one of Air Products important customers. ▲

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This is the Class 100 area of Air Products' Semiconductor Processing Applications Research Laboratory cleanroom where wafers are loaded and removed from the process tool. As a result of facility and equipment upgrades, a commercial-scale cluster tool, capable of processing eight-inch wafers, is now being employed to support a variety of research and customer support projects.

company doubles Allentown R&D electronics site

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improving chip-making processes, and supporting customer applications in the electronics industry. The Allentown facility is the largest of three R&D centers worldwide; other locations include Carlsbad, Calif. and Hsinchu, Taiwan. In addition, Air Products has almost 20 applications and development centers spanning the U.S., Europe, and Asia. ▲

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TSMC gives Air Products its "best supplier award" (continued from page 1)

reliability, quality, and the ability to provide extra support to TSMC when they faced the threat of supply interruptions when other bulk gas suppliers failed to meet their supply commitment.

"Air Products San Fu did a very wonderful job for TSMC in 2005. I appreciated your support every time we had an urgent need. This award

fully demonstrates their Asia team's flexibility and commitment. The effort and contribution truly deserves the gratitude and the award from TSMC. And the dedication of the local team really delivers unparalleled value to TSMC. Air Products San Fu deserves this honor," said Handy Ko, TSMC purchasing director. ▲

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DuPont Air Products Nanomaterials introduces new DCmP™ technology

DuPont Air Products NanoMaterials (DA NanoMaterials) has announced the introduction of DCmP™ technology, a new formulation for copper and tungsten chemical mechanical planarization (CMP) slurries. Because less slurry is required per wafer pass with DCmP™ formulations, the technology enables leading edge applications with a significantly lower cost of ownership for semiconductor fabricators.

The new DCmP™ formulations are proving to be strong performers in the market. Both CoppeReady® Copper and MicroPlanar® Tungsten Slurry products using the new DCmP™ formulations are in full production. Earlier this year, MicroPlanar® Tungsten clearly outperformed competitive products on

critical factors of dishing and erosion in a 65-nm customer evaluation.

"DCmP™ formulations answer the cost-of-ownership needs of our mainstream technology customers, and the performance requirements of the leading edge technology customers. It's a winning combination," said Floyd McClung, DA NanoMaterials CEO.

"The formulations are working to accelerate the growth DA NanoMaterials enjoyed during 2004. We are pleased to offer a solid portfolio of CMP products that are proving to be extremely successful in high-volume manufacturing at key fabricators worldwide."

CMP is an enabling technology for sub-0.35um technology nodes in semiconductor fabrication.

Planarization becomes increasingly more critical in photolithography as devices decrease in size.

In addition to the new DCmP™ formulations, DA NanoMaterials offers high performance products for the following electronic precision polishing applications—STI, ILD, PMD, Ruthenium, Pt, Ir, Si wafer polish, and polysilicon. Among those, MicroPlanar® STI, ILD, and PMD products and Syton® and Mazin® silicon wafer polish products are in large-volume manufacturing in Europe, the U.S., and Asia. Ruthenium CMP Slurry is qualified for production.

DA NanoMaterials was formed in 2000 as a joint venture to combine DuPont's success in developing and manufacturing colloidal silica sols and particles for electronics applica-

tions with Air Product's extensive manufacturing infrastructure, new product development and global supply of electronic gases and chemicals to the semiconductor industry. The joint venture is headquartered in Tempe, Ariz., where it operates a state-of-the-art applications and formulation laboratory. Customers also have access to the extensive analytical and research capabilities of each parent company.

(Editor's Note: CoppeReady® is a trademark of Air Products, licensed to DA NanoMaterials. MicroPlanar® is a registered trademark of EKC Technology licensed to DA NanoMaterials, and DCmP™ is a trademark of DuPont Air Products NanoMaterials.) ▲

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electronic
specialty
gases

Kulim Industrial Gases (KIG) wins Infineon bulk contract

Infineon Technologies AG awarded Air Products' Malaysian affiliate company, Kulim Industrial Gases, a contract to supply pipeline nitrogen and other bulk gases to Infineon's new Power Fab in the Kulim Hi-Tech Park (KHTP) in Malaysia. The award includes bulk molecules, BSGS (bulk specialty gases system) for storage, delivery, purification, analysis, distribution piping, and other related supply infrastructure.

Air Products has been supplying Kulim since 1996 via its air separa-

tion plant and underground nitrogen pipeline, which now serves eight customers.

This latest contract award further broadens Air Products' supply relationship and supply geography with Infineon. Air Products supplies pipeline, on-site, liquid bulk, electronic specialty gases, Schumacher specialty chemicals, HPPC process chemicals, ACT strippers, EES equipment, and MEGASYS management services to Infineon fabs throughout the world.

Kulim Industrial Gases won the contract to be Infineon's sole bulk gas supplier in August 2005. Target-on-stream dates are anticipated in early 2006.

"This is a great victory for us with people from Europe, North America, and Asia working together to load our existing facility in Kulim," said Corning Painter, vice president of Electronics Asia. ▲

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Kulim Infineon team.

NF₃ capacity expanded by almost 50 percent

Air Products has expanded its NF₃ capacity by almost 50 percent to over 2,000 metric tons per year. The increased capacity, almost double the capacity of the number two NF₃ supplier, results from the company's expansion of its electronics specialty gases production facility in Hometown, Pennsylvania. The additional NF₃ capacity is now fully on-stream.

"The completion of our third independent NF₃ plant at Hometown solidifies our position as the world's leading supplier of this essential, high-volume electronics specialty material," said Mike Hilton, vice president of the Electronics Division. "This expansion is part of a multi-year investment strategy that will continue to position us as one of the world's largest and most reliable providers of NF₃ and other electronics specialty gases."

NF₃ is used as a chamber cleaning gas in the manufacture of semiconductors, flat panel displays, and other electronic devices. When compared with competing products, NF₃ offers customers significant reductions in emissions, throughput increases of up to 30 percent, longer chamber life, and faster clean rates. NF₃ is also stable and non-flammable, making it a safe gas to transport, store, and deliver to customers around the world.

Air Products has safely manufactured and distributed NF₃ for more than 25 years from its Hometown facility. The company maintains reliable NF₃ supply throughout the world through multiple independent plants that continue to be optimized, and has built a solid infrastructure to facilitate the movement of NF₃ and other specialty products through strategically placed transfills in Taiwan, Korea, Japan, and Belgium. ▲

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ER teams hold 2005 training session in Taiwan

The Air Products San Fu off-site emergency response teams in Taiwan held their annual training in West Lake Resortopia in early August. Thirty ER members from six different teams attended.

The six teams cover all of Taiwan, which is divided into North, Middle, and South regions. Each region has two teams that alternate weeks on duty. Each team has five team members with one leader and two entry sub-teams.

The teams are responsible 24/7 for any Air Products San Fu customer emergency. Since each team member has been trained in basic

ER, this latest off-site training focused primarily on drill and team building. "This training is critical in developing the team skills, safety planning, and operations that are important elements in any emergency case," said Steve Chou, ESM general manager for Air Products San Fu.

With the addition of Schumacher and ECD products to the Air Products San Fu portfolio in early 2005—most of the August training focused on them and how to handle them in emergency situations. Practice drills were held to reinforce the ER overviews. ▲

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Air Products wins UMC supplier honor

Air Products San Fu received the "Supplier Appreciation Award" from UMC (United Microelectronics Corp.), the world's second largest semiconductor foundry. The award was for outstanding product quality and exceptional support.

Bruce Hargus, vice president of Electronics Sales and Operations, said Air Products was

honored to win the award. "It recognizes our supply reliability, ability to leverage technology to enhance production, and our competitiveness. We are grateful to have UMC as a customer and we take great pride in serving their needs."

This is the second time that Air Products San Fu has won the award from UMC in the last six months. In December 2004, Air Products San Fu received an "Excellent Safety Management" award for its involvement in UMC's Fab 12A Phase II expansion project.

"We are committed to being the best business partner and to providing the best product quality and service to UMC and all customers.

This award is a great accomplishment and reflects that commitment. We recognize that it takes more than one team to achieve this award and this award recognizes all San Fu and Air Products team members for their efforts and contributions." said Air Products San Fu President Allen Chien. ▲

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Pictured at the UMC awards ceremony from left are Tom Johnson, Electronics vice president of Air Products San Fu; Allen Chien, president of Air Products San Fu; Bruce Hargus, vice president of Electronics Sales and Operations; H.J. Woo, president of UMC; Roger Chung purchasing director of UMC; Kevin Hsieh, purchasing manager of UMC for process tool and facilities; Tateso Tsai, purchasing manager of UMC for ESM; and George Huang, Air Products San Fu UMC focus account manager.

The following technical papers were recently approved for publication and/or presentation:

"First Principle Calculations of Thermodynamics for Semiconductor Alloys" by Hansong Cheng, Vipul A. Parekh, and Rajiv Agarwal. *Chemical Physics Letters*, 412 (2005), pages 92-96.

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technical papers

news of interest:

ESG business wins a "Gassy Award"

The Electronic Specialty Gases business of Air Products picked up a prestigious "Gassy Award" at SEMICON West in San Francisco in mid-July. Air Products was recognized by *Gases & Technology* magazine for outstanding product innovation for its GASGUARD® Sub-Atmospheric Systems—Generated Gas Technology, which delivers arsine gas on demand to ion implant tools.

"GASGUARD sub-atmospheric systems offer a significant drop-in alternative to other systems typically used for ion implant gases," said Dave Tavianini, Air Products ESG business development manager. "The development of this groundbreaking system is a credit to the hard work and dedication of the entire electronic specialty gases team."

Gases & Technology received more than 43 entries for Gassy Awards in 14 categories. An independent committee of seven prestigious experts representing science, academia, and users in industry judged the entries.

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San Fu changes name to Air Products San Fu

San Fu Gas Co., Ltd., a subsidiary in which Air Products holds a majority share, has changed its English legal entity name to Air Products San Fu Co., Ltd. and its logo to Air Products' master one effective Sept. 7, 2005. The name change is part of Air Products' long-term strategies to consolidate a locally strong brand with the global Air Products name to support the strong business growth in Taiwan and in Asia.

Air Products first invested in San Fu Gas in 1987 and has gradually increased its investment to become a majority stakeholder. Ever since its partnership, Air Products and San Fu Gas have built considerable momentum in Taiwan and have established themselves as a market leader in the industry with a leading supply position serving some of the world's

leading semiconductor and flat panel manufacturers such as TSMC (Taiwan Semiconductor Manufacturing Corporation), UMC (United Microelectronics Corporation), Chi Mei Optoelectronics, AU, and Hannstar.

"Our new name reaffirms our continued and unrivaled commitment to customers. By further integrating Air Products' stringent environmental and safety standards, best practices, technology, and brand value with the San Fu Gas Company's 50 years of experience in Taiwan, Air Products San Fu will be the best choice for customers," noted Allen Chien, president of Air Products San Fu.

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Taichung warehouse open for business

Traditional drum beats and Chinese lion dances accompanied the opening of a new state-of-the-art warehouse for Electronics Specialty Materials (ESM) in Taiwan. The dances and drums are thought to bring good luck and especially profitable business. However, the Taiwan Global Operations team was also fully prepared for the more mundane aspects of efficient operations and safety management.

Steve Chou, general operations manager for Taiwan Electronics, noted "This was the first warehouse in Air Products where CI material flow techniques were used at the design stage, which will save us a lot of costs and increase safety from the start."

CI material flow techniques were used to optimize the flow of goods inside the facility. Other optimization techniques addressed the distribution of products from plants to warehouses and customers. All of these productivity improvements were achieved through intensive teamwork between Taiwan and North America. Substantial import duty savings will be made through the duty-free operation of the new warehouse.



Drummers and lion dancers were on hand to celebrate the opening of the Taichung Central Warehouse.

The Taichung Central Warehouse is located in a duty-free zone in the Taichung port in central Taiwan and is strategically located to serve as a "hub warehouse" for all imported gases. From here goods will be transported to smaller "just-in-time" distribution centers in the north and south of the island, or directly to customers.

The facility can store up to 16,000 gas cylinders in addition to several ISO tanks. The warehouse can meet Taiwan's growth target for the next five years. In addition to storage, the facility is also designed to efficiently handle incoming and outgoing quality and safety inspections of all products.

Joey Chen, Supply Chain manager for Taiwan said: "The central warehouse will more than double our available warehousing capacity in Taiwan and will bring much needed relief to other storage facilities on the island."

Local officials and Asia President Bob Dixon and GEG Group Vice President Mark Bye attended the opening ceremony. Noting Air Products' good safety record in his opening speech, Bye expressed the hope that the Taichung Central Warehouse will set new safety records and will serve as an example for the industry. ▲

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tell me more

www.airproducts.com/electronics

company information

Air Products is a Fortune 500 company with sales over \$5 billion annually and with major operations in 30 countries around the globe. We are a leading supplier of industrial gases, related equipment and services. Our success in industrial gases has come primarily through the development of new technologies that help our customers reduce their overall costs.

AIR PRODUCTS

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