



Materials for the LED Industry

Brighter LEDs. Lower costs.

Gases, Chemicals, Equipment, and Services for the LED Industry

A History of Performance



Air Products has more than 30 years' experience as a leading supplier of electronic materials (EM) and equipment to the LED industry. Our product offerings include:

- A leader in bulk supply of Ammonia (NH_3) with our GASGUARD Bulk Specialty Gas Supply (BSGS) system.
- Patented, heated ISO module fleet with global coverage.
- Supplying our White Ammonia to the leading MOCVD tool manufacturers for qualification of your tools before you receive them.
- Thin-film deposition specialty gases: Ammonia (NH_3), Arsine (AsH_3), Germane (GeH_4), Hydrogen Selenide (H_2Se), Phosphine (PH_3).
- Carrier gases: Argon (Ar), Helium (He), Hydrogen (H_2), Nitrogen (N_2).

Air Products brought a step change to high performance materials for high-brightness LED manufacturing with the introduction of White Ammonia grade at 99.99999% purity at <1 ppb H_2O and lowest oxygen compounds for optimal LED brightness. Air Products is a leading global supplier of this critical material for the growing LED market, including the first supplier to support large volume requirements with heated ISO module tankers and the Bulk Specialty Gas Supply (BSGS) system.

We operate one of the world's largest electronic materials and specialty gas production facilities in Hometown, Pennsylvania in the United States.



On-site Ammonia Now a Reality

We've built upon our core competency in bulk specialty gas supply to develop an on-site, high purity Ammonia distillation unit that will meet flow rate requirements beyond those supported by bulk containers. Air Products was first to market with a large-scale, on-site Ammonia distillation unit (located in China's Anhui Province). This offering enables customers to lower the total cost of ownership for ultra high purity ammonia while also reducing the risk of variation in quality as a result of frequent cylinder change outs.

Since the purchase of Solktronic Chemicals in 1998, we have significantly strengthened our position as a leading supplier to the global compound semiconductor industry. This has included serving customers in all major regions of the world. As a Responsible Care® company, we also continue to provide environmental, health and safety leadership to our customers, local authorities, and the industry in general.

Air Products' on-site White Ammonia plant recently won Gases & Instrumentation International magazine's 2012 Golden Gas Award for Gas Filtration & Purification.



Air Products' large-scale, on-site Ammonia (NH₃) distillation unit is now on-stream in China's Anhui Province.

EQUIPMENT

Gas and Chemical Delivery Systems

To complement our gas and chemical products, we also provide the delivery equipment to safely and reliably distribute these materials to your fab tools.

Air Products' equipment solutions are backed by more than 60 years of experience in the safe distribution of gases and chemicals. Our GASGUARD®, GasKeeper®, and ChemGuard® delivery systems have been recognized as the industry standard for cost-effective, fab-wide gas and chemical supply.

- GASGUARD Gas Cabinets: Recognized globally for their reliability and safety performance.
- GASGUARD Valve Manifold Boxes (VMBs): The industry's preferred method for cost-effective and efficient distribution to points of use.
- GASGUARD Bulk Specialty Gas Systems (BSGS): The system of choice for lowering cost of ownership through bulk supply of specialty materials. With more than 500 systems installed worldwide, BSGS enables customers to meet their high gas volume needs cost-effectively and safely.
- ChemGuard (CG) family of chemical delivery systems: The industry leader in cost-effective local and fabwide chemical supply options. With more than 2000 systems installed, our ChemGuard offering provides delivery solutions for difficult chemistries.



Our Bulk Specialty Gas Supply (BSGS) systems are economical and provide consistent product quality to the manufacturing process.

SERVICES

On-site gas and chemical management for your LED manufacturing process is available from Air Products through our MEGASYS® Gas and Chemical Management. This program delivers benefits of increased process reliability, wafer yield improvement, and zero material run-outs.

Focus on what you do best and leave the gas and chemical supply management to Air Products.

What is MEGASYS on-site management?

MEGASYS on-site gas and chemical management is a service that turns the day-to-day management of gas and chemical supply over to the trained technicians from Air Products. The Air Products team will manage gas and chemical equipment systems, cylinder changes, drum/tote changes, along with all the support activities needed to ensure performance for your manufacturing processes.

- On-site, day-to-day management of all gas and chemical supply systems.
- Material forecasting and control to minimize inventory costs.
- Improved safety management.
- World-class analytical and R&D support.
- Global technical center support.
- A long-term relationship between Air Products and the customer.



Our ChemGuard chemical delivery systems are backed by years of safe and reliable supply to the industries we serve.

GASES

Specialty Gases	Carrier Gases
Ammonia (NH ₃)	Argon (Ar)
Arsine (AsH ₃)	Helium (He)
Germane (GeH ₄)	Hydrogen (H ₂)
Hydrogen Selenide (H ₂ Se)	Nitrogen (N ₂)
Phosphine (PH ₃)	



Air Products' MEGASYS technicians provide day-to-day management of gas and chemical supply systems, ensuring maximum performance for your manufacturing processes.



The GASGUARD Bulk Specialty Gas Supply system provides customers with a safe and cost-effective way to meet high volume gas needs.

GLOBAL SUPPLY CHAIN

Ensuring the safety and security of global materials supply to our customers is very important. We have a strong focus on next-generation supply chain principles that make sure we provide a reliable and continuous flow of product to our customers.

Our global supply capability includes strategically placed gas, chemical, and equipment manufacturing sites, along with technical centers, and warehouses. Products for the LED and compound semiconductor industries are produced at major facilities at Hometown, Pennsylvania and Catoosa, Oklahoma in the United States. We operate the world's first large-scale, on-site Ammonia distillation unit in China's Anhui Province.

State-of-the-art gas and chemical delivery system manufacturing centers are located in Pennsylvania and South Korea. Support for our customers is offered through over a dozen technical centers in the U.S., China, Japan, Ireland, Malaysia, Singapore, South Korea, Taiwan and the United Kingdom. Major R&D facilities are in Japan, the U.S. and the U.K.

These supply chain themes are important to our customers and to us:

- Safely and efficiently serve our customer's growth.
- Collaborate with customers.
- Develop a demand driven supply network.
- People and global teamwork are critical to the success of any supply chain network.
- Use Continuous Improvement principles to maintain a focus on finding and implementing improvements.



GASGUARD gas delivery systems are known for their uptime and safe performance.

OUR PEOPLE

At Air Products we develop lasting relationships with our customers and communities based on understanding their needs, integrity in the way we do business, and a passion for exceeding expectations.

Relationships are important to our company. Our founder, Leonard Pool, understood what industrial gas users wanted, then found a way to give it to them, fundamentally changing the industry forever. Listening, understanding, providing—it's the Air Products way.



Why Air Products?

We are a supplier of White NH₃ to leading MOCVD tool manufacturers and, we work to fully understand our customers' needs and help them find the best materials solutions. But most importantly, our global employees are passionate about what they do. They are determined to help every customer squeeze the most out of every molecule, and to deliver those molecules 24/7 to where they're needed, when they're needed.

Talk to us; we'll listen . . .

For more information, please contact us at:

Corporate Headquarters

Air Products and Chemicals, Inc.
7201 Hamilton Boulevard
Allentown, PA 18195
T 800-654-4567
T 610-706-4730

Asia Headquarters

Electronics Division Headquarters
2F, 21 Chung Shan North Road
Section 2 Taipei, 104
Taiwan
T 886-2-25215891

Europe Headquarters

Air Products PLC
Hersham Place Technology Park
Molesey Road, Hersham
Walton-on-Thames
Surrey KT12 4RZ, UK
T 44 (0) 1932 249959



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www.airproducts.com/led