



# Air Products

Gas Supply Solutions for  
Lithium-ion Battery Production

# Air Products

## A World-Leading Industrial Gases Company

Air Products is a world-leading industrial gases company in operation for over 75 years. The company provides industrial gases and related equipment to dozens of industries, including refining, chemical, metals, electronics, manufacturing, and food and beverage.

The company has built a reputation for its innovative culture, operational excellence and commitment to safety and the environment. Our passionate, talented and committed employees aim to make Air Products the safest, most diverse and most profitable industrial gases company in the world, providing excellent service to our customers.

- NYSE listed (APD)
- Headquartered in Allentown, Pennsylvania, USA
- One of the safest companies in the industry



## Reaching Globally • Acting Locally



● Air Products Global Presence

# High Quality Industrial Gases

Air Products supports different aspects of lithium-ion battery production with its high purity and high quality gas supply and solutions.



## Stable and Reliable Helium Supply

Air Products has more than 60 years of experience in helium extraction, production, distribution and storage. You can count on our diversified helium source for stable and reliable supply of high quality helium.

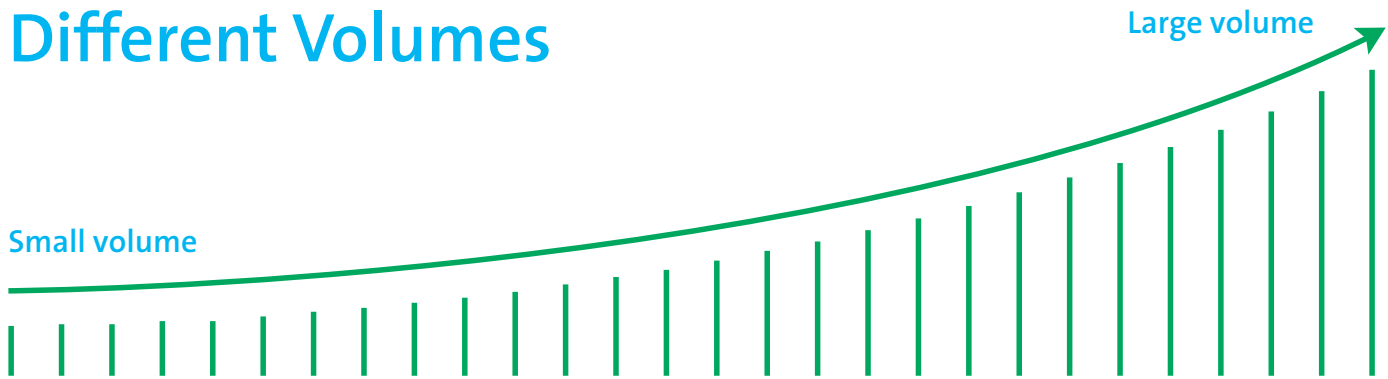
- Reliable supply: Helium sources from a diverse array of sources around the world
- Global network: High quality helium supply service, wherever you are
- The largest and most efficient fleet in the industry: delivering 30,000m<sup>3</sup> of helium per month
- Advanced helium applications technologies



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# Flexible Supply Options for Different Volumes



CryoEase® Microbulk Service



Liquid bulk



On-site gas generation



Large air separation unit and pipeline system

## CryoEase Microbulk Service

CryoEase Service is a simple and flexible supply option using compact on-site cryogenic tanks or cylinder packs (He, H<sub>2</sub>) that are regularly replenished by specially-designed delivery vehicles. Air Products also offers comprehensive pipeline installation service to help you optimize efficiency.

**Applicable gases:** argon, carbon dioxide, helium, hydrogen, nitrogen, oxygen

## Liquid bulk

A large volume on-site cryogenic tank is an ideal option for large-volume users. Liquid bulk gases will be delivered to your site by cryogenic trucks and stored in on-site cryogenic tanks. The remote monitoring system helps you monitor gas usage to ensure uninterrupted production.

**Applicable gases:** argon, carbon dioxide, helium, hydrogen, nitrogen, oxygen



## On-site gas generation

Air Products' PRISM® on-site gas generation systems bring stable and economical gas supply to lithium-ion battery customers. We design and install the systems based on your production needs, and provide gases that meet your purity, flow rate and pressure requirements. We also help improve productivity and safety by remotely monitoring the gas generation system on your site.

- PRISM VSA (vacuum swing adsorption) oxygen generation system
- PRISM PSA nitrogen generation system
- PRISM cryogenic nitrogen generation system
- PRISM hydrogen generation system

## Large air separation unit and pipeline system

We can build air separation plants at your sites according to your needs. Large volume of gases is supplied on real-time basis via pipeline systems in a safe and reliable way. We also help optimize resources allocation and reduce production cost.

**Applicable gases:** argon, nitrogen, oxygen



# Gas Applications for Lithium-ion Battery Production

As an indispensable component in manufacturing, industrial gases are widely used in various processes in lithium-ion battery production. As a world-leading industrial gas supplier with extensive industry experience, Air Products offers high quality gases, applications technologies, equipment, and services to meet your requirements on volume and purity, to help you reduce cost, improve productivity, product quality and safety.

Our experts also provide on-site process and technical support, including gas equipment safety inspection and training.

	Process	Air Products Solutions
<b>Cathode material</b> (e.g. LFP, NMC, NCA, LCO, LMO)	Material production precursor (inert protection)	<ul style="list-style-type: none"> <li>• Nitrogen supply: design, supply and installation</li> </ul>
	Material production and heat treatment	<ul style="list-style-type: none"> <li>• Nitrogen, oxygen and other gas supply: design, supply and installation</li> <li>• Process optimization: atmosphere detection, atmosphere optimization, atmosphere control (dew point, carbon potential, etc.), atmosphere recycling and reuse</li> </ul>
<b>Anode material</b> (e.g. Graphite, Si-C, LTO)	Material production and heat treatment	<ul style="list-style-type: none"> <li>• Nitrogen supply: design, supply and installation</li> </ul>
<b>Conductive agent</b> (e.g. Graphene, CNT, carbon black)	Material production and heat treatment	<ul style="list-style-type: none"> <li>• Nitrogen supply: design, supply and installation</li> <li>• Resource recovery: hydrocarbon condensation recovery and environmental treatment, hydrogen recovery and reuse</li> </ul>
<b>Electrolyte</b>	Material production (inert protection)	<ul style="list-style-type: none"> <li>• Nitrogen and argon supply: design, supply and installation</li> </ul>
<b>Cell production</b>	Cell assembly (inert protection)	<ul style="list-style-type: none"> <li>• Nitrogen, oxygen, carbon dioxide, argon and helium supply: design, supply and installation MAXX® Weld process gases</li> </ul>
<b>Battery case</b>	Welding	
<b>Battery leakage test</b>	Helium leakage test	
<b>Recycle</b>	Battery disassembly Material regeneration	<ul style="list-style-type: none"> <li>• Nitrogen and oxygen supply: design, supply and installation</li> <li>• Technical support: cryogenic grinding, CO<sub>2</sub> supercritical extraction, pyrometallurgy</li> <li>• Process optimization: atmosphere detection and control during material regeneration process</li> </ul>

# Comprehensive Technical Support for Lithium-ion Battery Production

## Air Products Technology Center

Air Products has its own research and development capabilities. Leveraging our deep understanding of local needs, as well as resources and capabilities in other parts of the world. Our technical experts bring innovative gas applications solutions closer and faster to customers around the world to meet their production needs.

- **Atmosphere detection** ( $H_2$ ,  $O_2$ ,  $CO$ ,  $CO_2$ ,  $C_xH_y$ ,  $SO_x$ ,  $NO_x$ ) for product quality control, production safety and environmental protection

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- **Atmosphere control** (including furnace atmosphere control, dew point control, and hydrogen monitoring) to control the heat treatment process and improve product quality

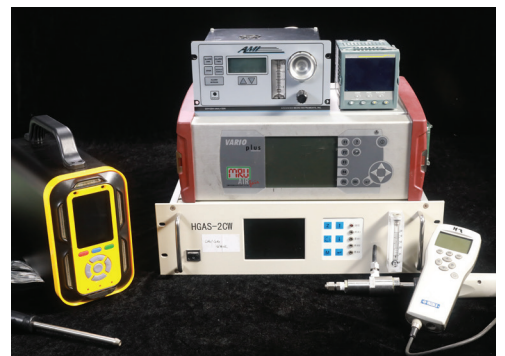
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- **Argon recycle and reuse** to save resources and reduce cost

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- **CFD flow field and thermal field simulation** to effectively optimize parameters, reduce the number of experiments, improve optimization efficiency

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**For more information,  
please contact us at:**

**Corporate Headquarters**

Air Products and Chemicals, Inc.

7201 Hamilton Boulevard

Allentown, PA 18195-1501

T 800-654-4567

F 800-272-4449

[info@airproducts.com](mailto:info@airproducts.com)



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[airproducts.com](http://airproducts.com)