



TOGETHER,
WE HAVE THE POWER
TO GENERATE A
CLEANER FUTURE.



Gas supply and technical support for lithium-ion battery production

GENERATING A CLEANER FUTURE

THE POWER TO REDUCE COSTS, INCREASE EFFICIENCY AND IMPROVE SUSTAINABILITY.



As a world-leading industrial gas supplier, Air Products works with battery cell manufacturers and cell recyclers to provide high quality gases, advanced applications technologies and services to meet your volume and purity needs.

Our team of experts also provides on-site process and technical support, including gas equipment safety inspection and training, to help:

- Reduce cost
- Increase productivity
- Improve product quality
- Improve on-site safety
- Reduce your CO₂ footprint

HOW AIR PRODUCTS HAS THE POWER TO HELP YOU.

Across many industries, our process and efficiency improvements have unlocked substantial potential savings – gains of more than 20% are not uncommon. Our industrial gases, technology and services are involved in, and can help optimise every stage of the battery production process.

Mining/Refining

- Ore processing, recovery and smelting

Chem Processing

- Carbonylation
- Inerting

Battery Component Manufacturing

- Annealing (busbars, foils, strip)
- Brazing (battery pack)
- Calcination (cathode)
- Drying (separator)
- Extrusion (profiles, connectors)
- Inerting (anode)
- Sintering (metallic, magnetic components)
- Soldering (PCB)
- Washing, Mixing, Drying (pCAM)

Battery Assembly

- Inerting
- Leak detection
- Welding

Recycling

- Cryogenic liberation
- Fire suppression
- Hydrometallurgy
- Pyrometallurgy
- Shredding Inerting
- Solvent recovery

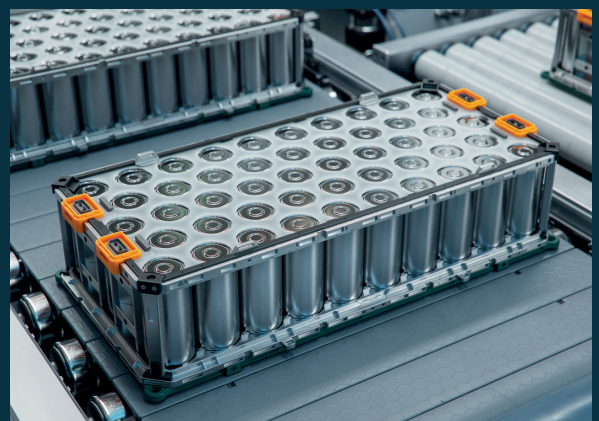
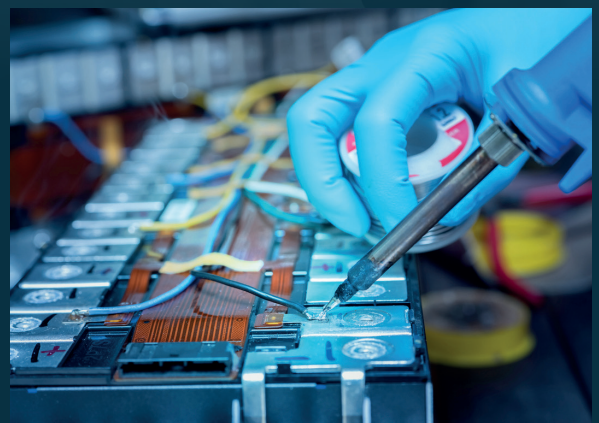


THE POWER OF COMPREHENSIVE TECHNICAL SUPPORT.

We offer a wide range of support for lithium-ion battery production, from computational modelling and thermodynamic calculations to engineering consulting during project design, start-up and ongoing operations. We also have a dedicated team including R&D which can look after site services for your plant and process – all designed to help you improve process efficiency, optimise product quality, control risks and meet legislative requirements.

Our services include:

- Atmosphere detection for product quality control, production safety and environmental protection
- Furnace atmosphere monitoring to examine the heat treatment process and improve product quality using Air Products Smart Technology
- Atmosphere recycle and reuse to save resources and reduce cost
- CFD flow field and thermal field simulation to effectively optimise parameters, reduce the number of experiments and improve optimisation efficiency



GAS APPLICATIONS FOR THE BATTERY SUPPLY CHAIN.

Battery Cell Assembly

Nitrogen (N₂)

Inerting during cell assembly/glove boxes, clean rooms, environmental stress chambers

Helium

Leak testing

Argon (Ar) / Carbon Dioxide (CO₂)

Welding

Carbon Dioxide (CO₂)

Fire suppression systems

Battery Recycling

Nitrogen (N₂)

Inerting during mechanical shredding and solvent recovery

Oxygen (O₂)

Pyrometallurgy

Oxygen (O₂) for ozone production

Hydrometallurgy (metal recovery)

Carbon Dioxide (CO₂)

Fire suppression systems in battery storage

Anode Materials

Nitrogen (N₂) / Argon (Ar)

Graphite manufacturing and graphite-silicon manufacturing

Electrode Foils

Nitrogen (N₂) / Hydrogen (H₂)

Copper/aluminium electrode manufacturing

Cathode Materials

Oxygen (O₂)

Nickel-based (i.e. NMC) cathode materials

Nitrogen (N₂)

Iron-based (i.e. LFP) cathode materials

Separator / Electrolyte

Nitrogen (N₂)

Separators, electrolyte manufacturing (inerting/clean rooms)

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Want to know more?

For more details of how Air Products can help your lithium-ion battery lifecycle management, contact us on [0800 389 0202](tel:08003890202) or [+44 1270 612708](tel:+441270612708) (from outside the UK) or visit airproducts.co.uk/batteries.



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