



CASE STUDY

DESIGNING LEAK-FREE BATTERY MANUFACTURING CLEANROOMS AND DRY ROOMS

Moisture-Sensitive Battery Production Environments, Where Leaks Are Not An Option

By: Jameson Ross and Drew Baldwin, Engineers at US Duct

1121 Corporation Drive, Archdale, NC 27263
336-530-1690
us-duct.com
info@us-duct.com



THE CHALLENGE

As battery manufacturers scale production to meet the growing demand for electric vehicles, energy storage systems, and advanced electronics, maintaining clean, controlled manufacturing environments has become more critical than ever.

Modern battery production facilities depend on highly controlled cleanrooms and dry rooms where airborne particles, process dust, moisture intrusion, and airflow inconsistencies can negatively impact product quality, safety, and production efficiency. Fine particulate generated during processing, material handling, mixing, coating, and cell manufacturing must be captured and contained without compromising the integrity of the manufacturing environment.

Even small leaks in a duct system can affect airflow performance, introduce contamination risks, reduce collection efficiency, and create maintenance challenges. In moisture-sensitive battery manufacturing operations, maintaining process control and containment is essential to protecting yield and ensuring reliable production. US Tubing by US Duct specifically identifies battery manufacturing as an application where tight control of fine particulate, process exhaust, moisture-sensitive areas, and critical airflow performance is required.

WHAT ARE BATTERY MANUFACTURING CLEANROOMS AND DRY ROOMS?

Battery cleanrooms and dry rooms are engineered environments designed to control airborne contamination while supporting critical manufacturing processes for lithium-ion and next-generation battery technologies.

These spaces use sophisticated filtration, ventilation, and airflow systems to maintain strict cleanliness standards throughout production. Air is continuously circulated, filtered, and conditioned to remove particulates and contaminants before being reintroduced into the manufacturing environment.

In battery facilities, cleanroom and dry room ventilation systems play a vital role in:

- Controlling airborne particulate
- Supporting moisture-sensitive manufacturing processes
- Capturing battery material dust at the source
- Maintaining consistent airflow and pressure
- Protecting product quality and production yields
- Enhancing worker and facility safety

As manufacturers continue increasing throughput and automation, reliable ductwork infrastructure becomes a critical component of overall facility performance.

BATTERY MANUFACTURING APPLICATIONS

Battery production facilities commonly include:

- Electrode Mixing and Processing
- Coating Operations
- Dry Rooms
- Cell Assembly Areas
- Module and Pack Manufacturing
- Energy Storage Production
- Research and Development Facilities
- Pilot Production Lines

THE APPLICATION

A leading battery manufacturer required a ducting solution capable of supporting critical cleanroom/dry room and process-exhaust applications while minimizing leakage and maximizing operational reliability.

The facility needed a system that would:

- Support leak-free airflow containment
- Protect moisture-sensitive production environments
- Capture and transport fine particulate efficiently
- Allow future expansion and process modifications
- Reduce installation and maintenance complexity
- Maintain consistent system performance over time

Traditional duct connections presented concerns regarding leakage, maintenance requirements, and long-term sealing reliability.



THE SOLUTION

➔ US TUBING BY US DUCT LEAK-FREE DUCTWORK

For battery manufacturing environments where leaks are not an option, US Tubing provides a premium clamp-connect ductwork solution designed specifically for applications where contamination control and airflow integrity are critical.

US Tubing combines:

- Laser-welded airtight construction
- Vanstone-flanged ends
- Fully encompassing V-gasket sealing technology
- Clamp-connect installation
- Modular system flexibility
- Galvanized and stainless-steel material options

Together, these features create a 100% leak-free ductwork solution for demanding industrial environments.

The Vanstone-flanged connection creates a consistent sealing surface around the full circumference of each connection. Our custom gasket and clamp system envelopes and compresses the connection to produce an airtight seal. This design helps contain air, particulate, mist, and process exhaust inside the ductwork where they belong.



RESULTS

By utilizing US Tubing in battery manufacturing cleanroom applications, facilities can benefit from:

Improved Contamination Control

Leak-free connections help maintain airflow integrity and reduce the risk of unwanted contamination entering critical manufacturing processes.

Enhanced Process Reliability

Consistent airflow and containment contribute to more stable operating conditions across moisture-sensitive and particulate-intensive production areas.

Faster Installation and Future Expansion

Clamp-connect construction supports quicker installation, easier modifications, and simplified system expansion as production requirements evolve.

Reduced Maintenance Concerns

Airtight construction helps minimize performance losses associated with traditional duct leakage while supporting long-term operational efficiency.

Scalable Manufacturing Support

Modular components make it easier to adapt ventilation and collection systems as battery production capacity grows.



WHY BATTERY MANUFACTURERS CHOOSE US

Battery manufacturing environments require more than standard industrial ductwork. They demand dependable containment, reliable airflow, and clean, efficient operation.

US Tubing was developed for industrial applications where contamination concerns, performance loss, maintenance issues, and safety risks cannot be tolerated. For cleanrooms, dry rooms, process exhaust systems, and particulate control applications within battery manufacturing facilities, US Tubing delivers the leak-free performance battery manufacturers need to support quality, safety, and production goals.

LEARN MORE

US Tubing Leak-Free Tubing

When leaks are not an option, build with US Tubing.

US Duct Industrial Ductwork

Complete industrial airflow solutions engineered to fit, install, and perform.

Contact US



(336)-904-0112



US-DUCT.COM



INFO@US-DUCT.COM

UST-Case-BATT-26-09-16-V1-A



**SCAN TO
VISIT OUR
WEBSITE**