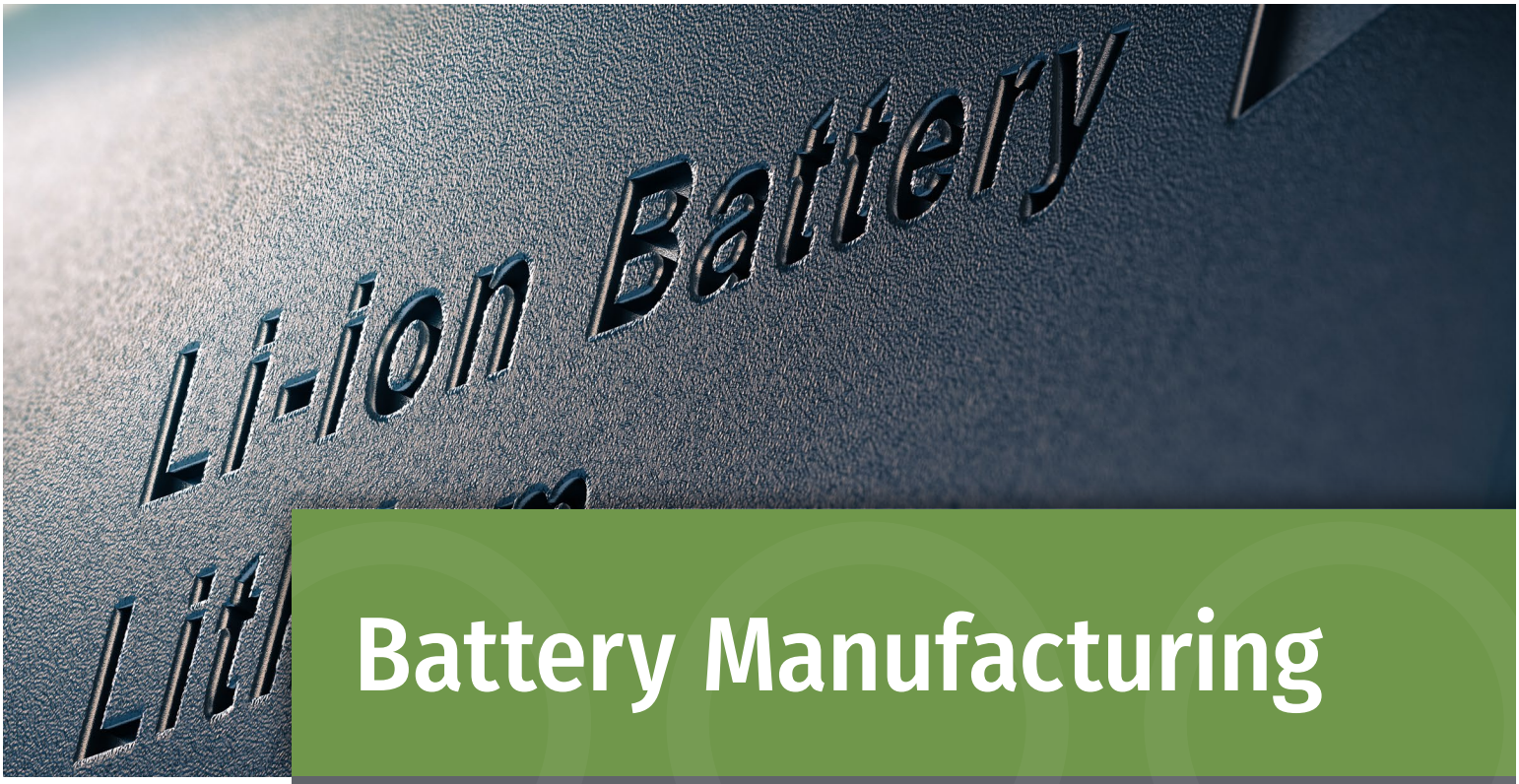


Battery Manufacturing

Combining significant process expertise, automotive, chemical, and advanced tech industry knowledge.

SSOE's expertise in the automotive, chemical, and advanced technology markets, combined with significant process experience, brings an unparalleled perspective to designing lithium ion battery manufacturing facilities. We understand the importance of establishing and maintaining the proper environmental conditions for hazardous material handling, cleanroom-type manufacturing environments, and spatial needs for assembly and production. Designing a battery manufacturing plant requires a unique combination of knowledge, which our technical experts learned on the ground floor of a major electric vehicle manufacturing plant inclusive of complete battery assembly packs.

Most importantly, we focus on your business objectives—getting your product out the door faster, better, and cheaper than your competitors. We've done this for some of the largest manufacturing projects in the world and have become experts in applying what we've learned to projects of all sizes.

EXPERTISE

- Battery assembly, packing, and storage
- Chemical storage
- Chemical mixing
- Chemical reclamation
- Cleanrooms
- Controlled environments
- Dry rooms
- Coatings
- Hazardous material handling
- Waste collection and treatment

#2
SEMICONDUCTOR DESIGN FIRM

Top 5 Semiconductor Design Firm for the past 9 years *(ENR)*

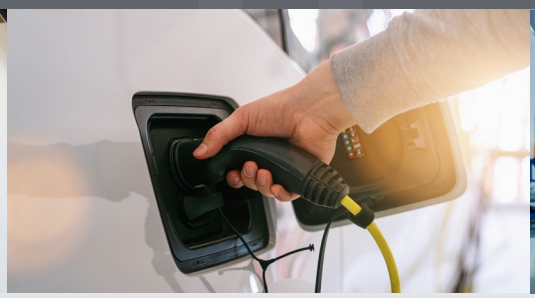
TOP 5
AUTOMOTIVE PLANT DESIGN FIRM

Top 5 Automotive Plant Design Firm for the past two years (*ENR*)

TOP 10
CHEMICAL PLANT DESIGN FIRM

Top 10 Chemical Plant Design Firm for the past two years (*ENR*)

SSOE®




PROVIDING CONTROLLED ENVIRONMENTS

SSOE understands that battery manufacturing requires the design of controlled environments for multiple functional areas to provide ISO Class cleanrooms, temperature and humidity control, exhaust, and abatement. We've implemented our expertise to design the mechanical, chemical, process, environmental, and waste systems for high-volume battery manufacturing facilities.

FUNCTIONAL AREAS:

- Mixing functional areas with ISO Class requirements, including humidity control, make-up air handling, recirculation air handling, dust collection, and exhaust systems.
- Cathode coating and roll press functional areas with ISO Class requirements, including desiccant dehumidification, make-up air handling, recirculation air handling, exhaust, and exhaust abatement systems.
- Anode coating and roll press functional areas with ISO Class requirements, including desiccant dehumidification, make-up air handling, recirculation air handling, exhaust, and exhaust abatement systems.
- Assembly functional areas with ISO Class requirements, including desiccant dehumidification, make-up air handling, recirculation air handling, exhaust, and exhaust abatement systems.
- Formation / Aging functional areas with humidity control, make-up air handling, and recirculation air handling systems.

SUPPORT SYSTEMS FOR MANUFACTURING:

- Chemical storage and delivery of high purity chemistries used in manufacturing.
- Electrostatic control in systems utilizing flammable and combustible chemistries utilized in manufacturing and maintenance.
- High purity on-site gas delivery, mixing, purification, generation, safety protocol, code analysis, area layout, and exhaust.
- Assembly of code summary documents for waste and chemical storage systems presented to local jurisdictions to enable design and maintain operation including:
  - Hazard and operability study (HAZOP) analysis and documentation.
  - Generation of Hazardous Management Inventory System documents.
  - Resource Conservation and Recovery Act (RCRA) documentation, coordination, and legal documentation.
  - Waste profile reporting.
  - Emissions summaries for permitting.
- Exhaust treatment and permitting for treatment of metals, hazardous, fluoric, RCRA, and general wastes.

CLEANROOM EXPERIENCE: 100+ PROJECTS IN THE LAST 5 YEARS

With over 30 years of experience in cleanroom design and installation for clients in the manufacturing, pharmaceutical, and semiconductor industries, SSOE has designed a variety of enclosures and rooms that have included programmable logic control (PLC) systems; heating, ventilation, and air conditioning (HVAC) systems; and high-efficiency particulate air (HEPA) / ultra-low particulate air (ULPA) filtration. In addition, we have specialized experience with the design of hazardous group "H" occupancy environments.

We have successfully completed more than 100 projects in the last five years involving cleanrooms of all scales and types including sterile cleanrooms—from very small to very large—and cleanliness classes from ISO 3 (Class 1) to ISO 8 (Class 100,000). Our multidisciplinary, integrated team can assist in layout development, value engineering, facility design, and process design, including chemical, waste treatment, and abatement systems. SSOE understands the unique challenges cleanroom projects present and routinely works with a select group of highly qualified partners for detailed and precise cleanroom construction.

EQUIPMENT DIGEST ARTICLE BY SSOE: "INSIGHTS INTO CLEANROOM HUMIDIFICATION CHALLENGES"

Keeping the humidity levels exactly right in a cleanroom can be a big challenge. Maintaining the ideal humidity is a matter of controlling the environment to strict tolerances and using specific solutions to ensure the target humidity is maintained.

CLICK HERE TO READ MORE.

DRY ROOM EXPERIENCE: ACHIEVING NEARLY 0% HUMIDITY

Automotive OEM / Battery Manufacturer Joint Venture. SSOE assisted in the design of aging and cycling rooms (dry rooms) per specifications and provided supporting utilities including coiling, filling, and capping cleanrooms as well as aging, cycling, and storage for the battery manufacturer's cell manufacturing plant within the OEM facility.

GM Battery Lab at the GM Tech Center. The product development laboratory's super dry cleanroom was designed to more stringent requirements than rooms used for product production. The traditional modular cleanroom wall panels would not seal sufficiently to maintain the near 0% relative humidity, so a dual in-seam sealing panel system frequently used on building exteriors was selected. Details were developed such that no enclosure joint had less than a double seal and no voids.