

Guide for



Motor Vehicle Battery Engineers in California

May also be called: Automotive Battery Engineers; Battery Applications Engineers; Battery Design Engineers; Battery Lab Engineers; Battery Test Engineers; Senior Battery Engineers

What Would I Do?

Battery Engineers (Motor Vehicle) work to research, design, and improve automobile batteries and to integrate them optimally with the motors and electrical systems of cars. Battery Engineers may work individually on research and production projects or as part of a team of engineers on various phases of production. A team of Battery Engineers can include workers from a wide variety of engineering and other backgrounds. Those with electrochemical and chemical engineering backgrounds are usually involved in the research and development of car batteries, especially lithium-ion batteries. On occasion, chemists are involved in research and development.

Battery Engineers involved in research and development manage the work plans of technical projects. They characterize and analyze the material properties of batteries, such as mechanical, substance and form, and electrochemical characteristics. They may research, identify and implement advanced materials and techniques related to electrode processing. Battery Engineers interpret and communicate battery material properties and characteristics as they relate to electrode manufacturing processes to the engineering team. They take the lead in the development of new analytical techniques, the design of experiment plans, and the coordination of battery development, building, and testing. They may present papers and reports to symposiums, conferences, and other technical meetings related to electrochemical technology.

Battery Engineers may also develop battery pack specifications based on product design. They are usually expected to work closely with battery pack manufacturers on battery execution, manufacture, and testing. They review battery controller board schematics and layout design. Battery Engineers are responsible for battery test plan creation and execution. They work with compliance engineers to ensure that battery packs meet all regulatory and carrier specifications. They conduct cell and pack factory evaluations and audits. Battery Engineers evaluate battery gas-gauging solutions. They analyze battery development and field failures.

Battery Engineers may help in the design and development of digital and analog electronics for battery control systems, including integrated and discrete components. They support the building and testing of prototypes. They work together with mechanical, thermal design, and validation engineers. They help production and test engineers in the introduction of new products to production, including test specification, debugging test procedures, and production support.

As Senior Battery Engineers, they may oversee an engineering team, coordinate all phases of project activity, and act as a liaison between the engineering team and internal and external customers, as well as management. Senior Battery Engineers may participate in the specification and design of all battery components, including mechanical, electrical, software, chemical, and electronic. They may lead system-level activities for battery sizing, battery life estimations, battery life test planning, and data

analysis. They provide direction on battery cell design and technology. They may help determine manufacturing feasibility to ensure that the design of all components, sub-systems, and the battery system optimize the manufacturing process at the sub-assembly, battery system assembly, and vehicle-level assembly. Senior Battery Engineers may help in establishing a quality assurance system to ensure a quality process and the delivery of a quality finished product. They manage or provide technical direction to designers, engineers, suppliers, and support personnel.

Tools and Technology

Battery Engineers use a variety of tools in their line of work, among them being: oscilloscopes, function generators, laboratory mixers, microcontrollers, spectrometers, voltage or current meters, frequency calibrators or simulators, and digital signal processors.

The technology and software that Battery Engineers use is complex and covers a wide range. The software they may use includes Computer aided design (CAD) software, financial analysis software, graphics or photo imaging software, object- or component-oriented development software, development environment software, word processing software, analytical software, and spreadsheet software.

Green Economy

Car makers continue to find and improve alternative fuels for automobiles such as all-electric or “hybrids” that run on a combination of battery-generated electricity and gasoline.

Electric and hybrid cars will depend on rechargeable batteries. While many advances in battery technology have been made, major car makers are looking for lightweight, long-lasting batteries that can provide a car with highway speed and are capable of powering the car over 200 miles or more without needing to be recharged.

Important Tasks and Related Skills

A formal survey to determine specific tasks and skill requirements for Battery Engineers (Motor Vehicle) has yet to be completed. Therefore, the sample tasks shown below reflect two closely related occupations: Chemical Engineers and Mechanical Engineers. Each task is matched to a sample skill required to carry out the task.

<i>Task</i>	<i>Skill Used in this Task</i>
Develop safety procedures to be employed by workers operating equipment or working in proximity to ongoing chemical reactions.	Writing
Operate computer-assisted engineering and design software and equipment to perform engineering tasks.	Computers and Electronics
Evaluate chemical equipment and processes to identify ways to optimize performance or to ensure compliance with safety and environmental regulations.	Systems Analysis
Confer with engineers, customers, and others to discuss existing or potential engineering projects and products.	Oral Expression
Determine most effective arrangement of operations such as mixing, crushing, heat transfer, distillation, and drying.	Critical Thinking
Perform tests and monitor performance of processes throughout stages of production to determine degree of control over variables.	Deductive Reasoning

Design and plan layout of equipment.	Information Ordering
Develop processes to separate components of liquids or gases or generate electrical currents using controlled chemical processes.	Engineering and Technology
Perform laboratory studies of steps in the manufacture of a new product and test proposed process in small scale operation such as a pilot plant.	Science
Direct activities of workers who operate or who are engaged in constructing and improving absorption, evaporation, or electromagnetic equipment.	Administration and Management
Direct and coordinate manufacturing, construction, installation, maintenance, support, documentation, and testing activities to ensure compliance with specifications, codes, and customer requirements.	Complex Problem Solving
Design, implement, maintain, and improve electrical instruments, equipment, facilities, components, products, and systems for commercial, industrial, and domestic purposes.	Operations Analysis
Oversee project production efforts to assure projects are completed satisfactorily, on time and within budget.	Monitoring
Integrate electrical systems with renewable energy systems to improve overall efficiency.	Systems Evaluation

Source: U.S. Department of Labor [Occupational Information Network \(O*NET\)](https://online.onetcenter.org) at online.onetcenter.org

Working Conditions

Most Battery Engineers work in office buildings, laboratories, or industrial plants. They need to follow safety procedures and wear personal protective equipment, such as safety glasses, gloves, protective clothing and footwear, and respiratory masks.

Many Engineers work a standard 40-hour week. At times, deadlines or design standards require Engineers to work longer hours. Some Engineers travel extensively to battery production plants or other work sites in the United States and abroad.

Unionization is not common in this occupation.

Will This Job Fit Me?

The job of Battery Engineer may appeal to those who enjoy working with ideas and activities that require an extensive amount of thinking and include practical, hands-on problems and solutions.

This occupation could be a good fit for individuals who want to help reduce the use of fossil fuels while using their skills in math and science. Those who enjoy designing and constructing products that aid in the reduction of air pollution may like this job. Battery Engineers tend to be analytical, creative, dependable, detail-oriented, and inquisitive. They are also able to adapt and place high importance on achievement, cooperation, leadership, and innovation. They must be able to work alone or as part of a team.

What Wages and Benefits Can I Expect?

Wages for Battery Engineers in California differ widely depending on job duties, work experience, and location of the work.

Wages

A formal salary survey is not available; however, references to annual salaries range from \$75,000 to \$115,000. Salaries depend on the pay structure established by each employer for work performed, the nature of the project, and the skill of the specialists. Generally, workers in large cities earn higher wages than those who work in small towns and rural areas.

Benefits

Employers usually provide a benefits portfolio including health care, dental, and vision benefits; life insurance; vacation; sick leave; paid holidays; retirement plans; and other incentive plans.

What is the Job Outlook?

As this is an emerging occupation, the number of Battery Engineers in California is unknown at this time. Currently, most Battery Engineers work outside of California in places like Detroit or Japan. However, employment opportunities in California may increase in the future considering society's growing interest in environmental protection and the development of alternatives to gas-powered cars. State and federal laws requiring greater fuel efficient vehicles may also increase the demand for Battery Engineers.

How Do I Qualify?

Education, Training, and Other Requirements

A bachelor of science (B.S.) in engineering, chemistry, or materials science is usually the minimum educational level that employers will consider for a position as a Battery Engineer, Motor Vehicle. Most jobs require a master of science (M.S.) degree or a doctorate of philosophy (Ph.D.). Relevant engineering fields include chemical, electrochemical, electrical, and mechanical engineering. Engineering programs involve a concentration of study in an engineering specialty, along with courses in mathematics, physical and life sciences, and hands-on laboratory classes. Chemical and electrochemical engineers, in addition to the core classes, which often reflect chemical engineering basics, may also take courses that focus on lithium-ion battery technology, corrosion engineering, microelectronic processing, pollution prevention, air pollution, and environmental compliance. Advanced computer skills are also vital to a Battery Engineer's education.

Experience

In addition to a B.S. or M.S. in the fields of study mentioned above, Battery Engineers may need at least five years professional experience related to automotive battery engineering. They are usually expected to have practical laboratory experience with nickel-metal hydride (NiMH) and lithium-ion battery chemistries, cell design, and pack assembly. Automotive powertrain systems and/or component testing experience is often preferred. Some employers require five or more years experience in computational analysis and physical testing of thermal systems (automotive or battery).

Early Career Planning

High school students planning to become Battery Engineers should take college preparatory courses such as English, mathematics, biology, chemistry, physics, and computer science. Students would also benefit from participating in extracurricular science or engineering programs geared toward middle and high school students such as Odyssey of the Mind; Science Olympiad; and Science, Technology, Engineering, and Mathematics (STEM) programs.

Continuing Education

Continuing education is currently not a requirement for maintaining a professional engineer's license in California. However, it is important for Engineers to keep up to date with the latest developments in their field to do their jobs properly.

Licensing and Certification

The professional engineering (PE) license is generally not required in this specialty field, but possession of a license in related specialties such as chemical and mechanical engineering may enhance one's chances of employment or promotion.

Contact the agency that issues the license for additional information. Click on the license titles below for details.

- [Mechanical Engineer](#)
www.labormarketinfo.edd.ca.gov/OccGuides/LicenseDetail.aspx?LicID=76914
- [Chemical Engineer](#)
www.labormarketinfo.edd.ca.gov/OccGuides/LicenseDetail.aspx?LicID=7692

To become licensed, an engineer of any description must first pass the Engineer-in-Training examination that requires at least three years of coursework from a college or university offering an engineering program accredited by Accreditation Board for Engineering and Technology (ABET), or three years of engineering-related experience.

There are a variety of certificates available for the numerous disciplines that make up the occupation of Battery Engineers. These certifications are offered by various professional organizations.

For more information, go to the U.S. Department of Labor's Career InfoNet Web site at www.acinet.org and scroll down to "Career Tools." Click on "Certification Finder" at www.acinet.org/certifications_new/default.aspx and follow the instructions to locate certification programs.

Where Can I Find Training?

There are two ways to search for training information at www.labormarketinfo.edd.ca.gov/?Pageid=1013:

- [Search by Field of Study](#) to find what programs are available and what schools offer those programs. You may use keywords such as: Chemical Engineer and Electrical Engineer.
- [Search by Training Provider](#) to find schools by name, type of school, or location.

Contact the schools you are interested in to learn about the classes available, tuition and fees, and any prerequisite course work.

Where Would I Work?

Motor Vehicle Battery Engineers generally work in the battery or motor vehicle manufacturing industries, as well as research and development engineering firms.

Finding a Job

Online job opening systems include JobCentral at www.jobcentral.com and CalJOBSSM at www.caljobs.ca.gov.

To find your nearest One-Stop Career Center, go to [Service Locator](#) at www.servicelocator.org. View helpful job search tips at www.labormarketinfo.edd.ca.gov/occguides/JobSearchTips.pdf (requires [Adobe Reader](#)).

Yellow Page Headings

You can focus your local job search by checking employers listed online or in your local telephone directory. Below are some suggested headings where you might find employers of Battery Engineers.

- Automobile Manufacturers
- Batteries Wholesale & Manufacturers

Find Possible Employers

To locate a list of employers in your area, use “Find Employers” on the LaborMarketInfo Web site at <http://www.labormarketinfo.edd.ca.gov/aspdotnet/databrowsing/empMain.aspx?menuChoice=emp>

- Select the search for employers by occupation.
- Select a geographic area.
- Search for an occupation by keyword, occupation, or category.
- Select one of the top industries that employ the occupation.
- This will give you a list of employers in that industry in your area.
- Click on “View Filter Selections” to limit your list to specific cities or employer size.
- Click on an employer for the street address, telephone number, size of business, Website, etc.
- Contact the employer for possible employment.

Where Could This Job Lead?

Some Battery Engineers can become Senior Battery Engineers, engineering managers, or heads of automotive research and development labs.

Related Occupations

Below is a list of standard occupations related to Motor Vehicle Battery Engineers:

- Automotive Engineers (17-2141)
- Chemical Engineers (17-2041)
- Chemists (19-2031)
- Electrical Engineers (17-2071)
- Materials Scientists (19-2032)
- Mechanical Engineers (17-2141)

Other Sources

- California Energy Commission
www.energy.ca.gov
- National Renewable Energy Laboratory
www.nrel.gov
- U.S. Energy Information Administration
www.eia.doe.gov
- Accreditation Board for Engineering Education
www.abet.org
- American Society for Engineering Education
www.asee.org
- The Association of Energy Engineers
www.aeecenter.org
- National Society of Professional Engineers
www.nspe.org

These links are provided for your convenience and do not constitute an endorsement by EDD.

For the Career Professional

The following codes are provided to assist counselors, job placement workers, or other career professionals.

System	Code
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SOC – [Standard Occupational Classification](http://www.bls.gov/soc) at www.bls.gov/soc

N/A

O*NET – [Occupational Information Network](http://online.onetcenter.org) at online.onetcenter.org

N/A

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