Oil and Petroleum Chemists

… Work in a high-pressure environment

The oil and petroleum business is a high-pressure, high-stakes field that offers a broad range of career opportunities for chemists. Because even small decisions can mean financial gains or losses for one's employer, the business offers a dynamic combination of excitement and responsibility.

It's also a setting quite unlike the academic world, and one that for many young chemists requires a major shift in thinking. In school, a graduate student can focus on a paper as the end product; but in the oil and petroleum industry, chemists succeed only when their ideas are put into practice. And, although many universities are moving in this direction, the oil and petroleum industry places increasing emphasis on work accomplished by teams rather than by individuals. With a focus on profitability, companies can be ideal places for people who like to see their ideas become reality.

… Apply knowledge of chemistry in many ways

The oil and petroleum industry offers chemists and chemical engineers a broad range of work opportunities over a wide area of chemistry. For example, specialists in chemometrics rely on statistical and computer expertise to put lab instruments online at a refinery. Working with delicate machines can be a challenging assignment anywhere, but in a refinery they must operate under hostile conditions—including temperature extremes, vibrations from surrounding equipment, continuous operation, and locations that make monitoring difficult.

With crude oil being the raw material for polymer production, there are positions for polymer chemists throughout the field. Since these positions are also defined by the demands of a business environment, most polymer chemists work on projects with real-world applications rather than do "research for its own sake." Many in the industry view polymers as a growing field in which many questions are unanswered and many areas still untested.

Exploration and production are major areas of effort in the petroleum industry (often referred to as the "upstream" part). Companies operating in these fields, as well as in the "downstream" areas of refining and marketing, employ people trained in chemical engineering, physical chemistry, computer technology, geochemistry, and tracer chemistry (to name a few areas). Biochemistry is also important in the production of oil since bacteria can change the quality of oil over time, creating interference with production, downstream corrosion problems, and toxic hazards. The chemistry of catalysts is also very important to the industry. Inorganic chemists, organic chemists, analytical chemists, and chemical engineers all have a role in catalyst technology for the petroleum and petrochemical industries.

… Increasingly rely on computer skills

Although their chief mission is to make products, oil and petroleum companies also do research. In recent years, however, this research has become more applied and product-focused. Chemists in oil and petroleum companies increasingly use computers and computational chemistry to reduce the cost and time of research. They also use computer modeling to target the most promising areas for exploration, aid in decision-making, and control field and transportation functions.

… Interact in a business-focused environment

Oil and petroleum businesses tend to feature fast-paced, collaborative environments. As result, many find that while their technical knowledge and skills are critical to obtaining a position, their effectiveness on the job relies just as much on skills such as time management, communication, and cooperation.

Cooperation also extends outside one's company. Complying with environmental regulations is more important in industry than ever before, and scientists must always be mindful of how a process or petroleum product will affect the environment.

There is a widespread public perception that oil and petroleum are bad for the environment, and the public tends to forget that oil and petroleum products are used every day to heat houses, power cars, and produce a range of synthetic materials. Because of these challenges, new career options have arisen, including jobs in corporate government relations, public outreach and risk communication, and government agencies that ensure compliance with environmental regulations. Research to replace existing refinery processes and products with cleaner, safer, and more energy-efficient ones has also expanded career opportunities.

American Chemical Society, Education and International Activities Division,
1155 Sixteenth Street, NW, Washington, DC 20036; 800-227-5558; chemistry.org

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FACT FILE: Oil and Petroleum Chemists

WORK DESCRIPTION ► Chemists in the oil and petroleum industry work with crude oil and the products derived from it, including petroleum for automotive or aviation fuel as well as petrochemical feedstocks, which are used in a range of polymer products. Chemists in the field have a similarly broad spectrum of jobs: from "fingerprinting" oil leaked in a spill to process control at the refinery, and from developing catalysts used in the refining process to creating new polymers for fibers and resins.

WORKING CONDITIONS ► Oil and petroleum chemists work mostly in the lab. Some have jobs that take them into the refinery, but usually on a short-term basis. Others may work temporarily in the field, collecting samples. Chemists work in groups and often with chemical engineers. Communication skills are vital—not just with other scientists, but also with marketing managers and with the media. The field has been traditionally male-dominated, but many companies are making efforts to attract a more diverse group of workers in terms of gender, ethnicity, and other factors.

PLACES OF EMPLOYMENT ► Most chemists in this field work for large oil companies. Others work with independent companies that develop processes for the oil industry, such as fluid-cracking catalysis, or that make chemicals used to aid drilling and refining. Many chemists work at companies that supply chemicals for petroleum companies and provide technical support for handling environmental systems.

PERSONAL CHARACTERISTICS ► Chemists in the oil industry describe themselves as practical people who are interested in solving problems. Some say they are more interested in the development of scientific products than in pure science. Most underscore the importance of liking lab work, being able to work on a team, and communicating with chemical engineers, product managers, and customers. Because the industry is product-focused, an interest in business and a flair for sales can also be helpful.

EDUCATION AND TRAINING ► A Ph.D. is generally necessary if you want a research position in the oil and petroleum industry. Postdoctoral work is not considered necessary, though it may give you an edge in getting a job. There is a range of chemist and chemical engineering positions for people with bachelors' and master's degrees. Scientists whose backgrounds include chemical engineering may be better prepared for work in this industry, with its emphasis on essential business considerations such as cost/benefit analysis. A solid foundation in organic and physical chemistry is vital, and analytical chemistry skills are extremely important. Technical skills, communication skills, teamwork, and leadership are also crucial.

JOB OUTLOOK ► The oil and petroleum industry is hiring fewer chemists now as companies downsize because of budget constraints and a drop-off in profits since the 1990s. There have been layoffs across the industry, and the job market right now is highly competitive. Basic research has also declined. Whereas long-term research projects once spanned 10–15 years, they now are much shorter and are typically more focused on solving immediate problems.

SALARY RANGE ► Petroleum chemists beginning their career in industry can expect starting annual salaries in the mid-$40,000s at the B.S. level and in the low- to mid-$80,000s at the doctorate level. After about 10 years in the field, the B.S. petroleum chemist earns about $60,000 per year, and the petroleum chemist with a doctorate earns about $95,000 per year.

FOR MORE INFORMATION

American Chemical Society
Division of Petroleum Chemistry
1155 16th St., NW
Washington, DC 20036
800-227-5558
membership.acs.org/P/PETR

American Petroleum Institute
1220 L St., NW
Washington, DC 20005
202-682-8000
www.api.org

WHAT YOU CAN DO NOW ► The oil and petroleum industry is a corporate environment. To find out whether this atmosphere would suit you, try to get experience through summer internships or by participating in a university–industry technology transfer. While you are in school, it is important to develop a strong foundation in organic chemistry, but you will be a more attractive candidate if you broaden your skills with courses in industrial chemistry and business. Course work in statistical design is also strongly recommended.