



LIFE AS A CHEMICAL ENGINEER WORK SKILLS, INTEREST & COMPETENCIES

Introduction

Imagine taking what you've learned in chemistry class and using it to create products that improve the lives of others in both large and small ways. That's what a chemical engineer does: uses chemical processes to find innovative and creative ways of producing goods. The work of a chemical engineer can range from the luxurious (developing softer clothes and better cosmetics) to the lifesaving (producing fire-resistant materials and safer foods). As a chemical engineer, you might be involved in cutting-edge research at a pharmaceutical company, discovering how to extend the shelf life of antibiotics, or you might be part of a creative team at a food manufacturing company, dreaming up a delicious new candy bar.

Chemical engineering basically is applied chemistry. It is the branch of engineering concerned with the design, construction, and operation of machines and plants that perform chemical reactions to solve practical problems or make useful products.

Some chemical engineers make designs and invent new processes. Some construct instruments and facilities. Some plan and operate facilities. Chemical engineers have helped develop atomic science, polymers, paper, dyes, drugs, plastics, fertilizers, foods, petrochemicals... pretty much everything. They devise ways to make products from raw materials and ways to convert one material into another useful form. Chemical engineers can make processes more cost effective or more environmentally friendly or more efficient.

Job Prospects

With a degree in chemical engineering, you are ready to tackle a challenge in a variety of fields and have the creativity to come up with a number of solutions.

You could head to the food industry to design healthier potato chips or soda bottles that keep the fizz forever.

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You could work in the oil and gas arena, designing looking at ways to harness energy in environmentally and economical ways.

You could explore the plastics industry, seeking to reduce waste, develop applications for biodegradable plastics and come up with the latest and greatest new gadget.

You could work for a consumer product company, figuring out how to make a toothbrush that has bristles that never wear out or new household cleaners or never-chip fingernail polish.

Chemical engineers are everywhere you find paints, plastics, food, packaging, medicine and so many other things we interact with in our daily lives.

Chemical engineers work in a variety of environments and it can vary based on your interests. It can be a office setting, a corporate lab setting or a university lab setting, or a production environment in a chemical plant.

Chemical engineering is one of the most diverse engineering fields. With chemical engineering, you really can make a world of difference!

LIFE OF A CHEMICAL ENGINEER

Tasks

- Develop safety procedures to be employed by workers operating equipment or working in close proximity to on-going chemical reactions.
- Troubleshoot problems with chemical manufacturing processes.
- Evaluate chemical equipment and processes to identify ways to optimize performance or to ensure compliance with safety and environmental regulations.
- Conduct research to develop new and improved chemical manufacturing processes.
- Determine most effective arrangement of operations such as mixing, crushing, heat transfer, distillation, and drying.
- Perform tests and monitor performance of processes throughout stages of production to determine degree of control over variables such as temperature, density, specific gravity, and pressure.
- Design and plan layout of equipment.
- Prepare estimate of production costs and production progress reports for management.
- Design measurement and control systems for chemical plants based on data collected in laboratory experiments and in pilot plant operations.

- Develop processes to separate components of liquids or gases or generate electrical currents using controlled chemical processes.

Tools & Technology

Tools used in this occupation:

Catalytic combustion analyzers — Catalytic reactors

Chromatographic scanners — Chromatographic scanning equipment

Laboratory mixers — Agitators; Benchtop mixers; Powder mixing equipment

Robotic or automated liquid handling systems — Vial handling systems

Ultrafiltration equipment — Plate filter presses

Technology used in this occupation:

Analytical or scientific software — Chempute Software Engineer's Aide SINET; G&P Engineering Software EngVert; SoftLab PHEdesign; Thermal Analysis Systems The Energy Analyst

Computer aided design CAD software — CD-adapco STAR-CAD; SolidWorks CAD software

Data base user interface and query software — Chempute Software E-Notebook; G&P Engineering Software PhysProps; Microsoft Access; Relational database software

Object or component oriented development software — C++; Microsoft Visual C# .NET

Spreadsheet software — Microsoft Excel

Knowledge

Engineering and Technology — Knowledge of the practical application of engineering science and technology. This includes applying principles, techniques, procedures, and equipment to the design and production of various goods and services.

Chemistry — Knowledge of the chemical composition, structure, and properties of substances and of the chemical processes and transformations that they undergo. This includes uses of chemicals and their interactions, danger signs, production techniques, and disposal methods.

Mathematics — Knowledge of arithmetic, algebra, geometry, calculus, statistics, and their applications.

Physics — Knowledge and prediction of physical principles, laws, their interrelationships, and applications to understanding fluid, material, and atmospheric dynamics, and mechanical, electrical, atomic and sub-atomic structures and processes.

Production and Processing — Knowledge of raw materials, production processes, quality control, costs, and other techniques for maximizing the effective manufacture and distribution of goods.

English Language — Knowledge of the structure and content of the English language including the meaning and spelling of words, rules of composition, and grammar.

Design — Knowledge of design techniques, tools, and principles involved in production of precision technical plans, blueprints, drawings, and models.

Administration and Management — Knowledge of business and management principles involved in strategic planning, resource allocation, human resources modeling, leadership technique, production methods, and coordination of people and resources.

Computers and Electronics — Knowledge of circuit boards, processors, chips, electronic equipment, and computer hardware and software, including applications and programming.

Mechanical — Knowledge of machines and tools, including their designs, uses, repair, and maintenance.

Skills

Science — Using scientific rules and methods to solve problems.

Complex Problem Solving — Identifying complex problems and reviewing related information to develop and evaluate options and implement solutions.

Critical Thinking — Using logic and reasoning to identify the strengths and weaknesses of alternative solutions, conclusions or approaches to problems.

Judgment and Decision Making — Considering the relative costs and benefits of potential actions to choose the most appropriate one.

Systems Analysis — Determining how a system should work and how changes in conditions, operations, and the environment will affect outcomes.

Mathematics — Using mathematics to solve problems.

Active Learning — Understanding the implications of new information for both

current and future problem-solving and decision-making.

Reading Comprehension — Understanding written sentences and paragraphs in work related documents.

Systems Evaluation — Identifying measures or indicators of system performance and the actions needed to improve or correct performance, relative to the goals of the system.

Operations Analysis — Analyzing needs and product requirements to create a design.

Abilities

Information Ordering — The ability to arrange things or actions in a certain order or pattern according to a specific rule or set of rules (e.g., patterns of numbers, letters, words, pictures, mathematical operations).

Mathematical Reasoning — The ability to choose the right mathematical methods or formulas to solve a problem.

Problem Sensitivity — The ability to tell when something is wrong or is likely to go wrong. It does not involve solving the problem, only recognizing there is a problem.

Category Flexibility — The ability to generate or use different sets of rules for combining or grouping things in different ways.

Deductive Reasoning — The ability to apply general rules to specific problems to produce answers that make sense.

Inductive Reasoning — The ability to combine pieces of information to form general rules or conclusions (includes finding a relationship among seemingly unrelated events).

Oral Comprehension — The ability to listen to and understand information and ideas presented through spoken words and sentences.

Written Comprehension — The ability to read and understand information and ideas presented in writing.

Number Facility — The ability to add, subtract, multiply, or divide quickly and correctly.

Fluency of Ideas — The ability to come up with a number of ideas about a topic (the number of ideas is important, not their quality, correctness, or creativity).

Work Activities

Making Decisions and Solving Problems — Analyzing information and evaluating results to choose the best solution and solve problems.

Analyzing Data or Information — Identifying the underlying principles, reasons, or facts of information by breaking down information or data into separate parts.

Getting Information — Observing, receiving, and otherwise obtaining information from all relevant sources.

Communicating with Supervisors, Peers, or Subordinates — Providing information to supervisors, co-workers, and subordinates by telephone, in written form, e-mail, or in person.

Interacting With Computers — Using computers and computer systems (including hardware and software) to program, write software, set up functions, enter data, or process information.

Updating and Using Relevant Knowledge — Keeping up-to-date technically and applying new knowledge to your job.

Organizing, Planning, and Prioritizing Work — Developing specific goals and plans to prioritize, organize, and accomplish your work.

Processing Information — Compiling, coding, categorizing, calculating, tabulating, auditing, or verifying information or data.

Thinking Creatively — Developing, designing, or creating new applications, ideas, relationships, systems, or products, including artistic contributions.

Identifying Objects, Actions, and Events — Identifying information by categorizing, estimating, recognizing differences or similarities, and detecting changes in circumstances or events.